EXHIBIT 1

UNITED STATES DISTRICT COURT

DISTRICT OF MINNESOTA

In re Bair Hugger Forced Air Warming Products Liability Litigation	MDL No. 15-2666 (JNE/FLN)
This Document Relates to All Actions	**EXPERT REPORT OF DR. WILLIAM R. JARVIS**

I. Education and Experience

I am a medical doctor with extensive experience in the areas of infectious disease, healthcare epidemiology, infection control, and pediatrics (Attachment A-Curriculum Vitae). I received my M.D. at the University of Texas, Houston in 1974 and my B.S. in Psychology with High Honors at the University of California, Davis in 1970. I was a Pediatrics Intern at the University of Texas at Houston (1974-1975), a Pediatric Resident at the University of Southern California's Children's Hospital of Los Angeles (1975-1977), a Pediatric Infectious Diseases Fellow at University of Toronto's Hospital for Sick Children (1977-1978), a Pediatric Infectious Diseases, Virology and Epidemiology Fellow at Yale University School of Medicine (1978-1980), and an Epidemic Intelligence Service (EIS) Officer and a Preventive Medicine Resident at the Centers for Disease Control and Prevention (CDC) Hospital Infections Program (HIP) (1980-1983).

From 1980-2003, I worked in various leadership roles at the CDC in Atlanta, Georgia, focusing on the investigation and prevention of infectious diseases—particularly infections and other complications associated with healthcare. I held a number of titles during these 23 years, including Assistant Chief, National Nosocomial Infections Surveillance (NNIS) system (currently, the National Healthcare Safety Network [NHSN]); Chief, Epidemiology Branch; Chief, Investigation and Prevention Branch; and Acting Director, Hospital Infections Program (HIP); Assistant Director for Science, Division of Healthcare Quality Promotion (DHQP); and Director, Office of Extramural Research, Office of the Director, National Center for Infectious Diseases. For 17 years, I supervised the conduct of all Divisional outbreak investigations of healthcare associated-infections (HAI) in healthcare settings, the development of HAI prevention guidelines (including the 1999 Guideline for the Prevention of Surgical Site Infections [SSIs]) and of epidemiological studies of HAIs and their prevention.

In addition to my work at CDC, I also was a Clinical Associate Professor at the Emory University School of Medicine and an Assistant Professor at the Emory University Rollins School of Public Health. I am the former president of the Society for Healthcare Epidemiology of American (SHEA) and the former Chair of the Research Foundation of the Association for Professionals in Infection Control and Epidemiology, Inc. (APIC). I have published widely in the areas of infectious diseases, infection control, epidemiology, prevention of SSIs, public health, and pediatrics. I have published >400 peer-reviewed publications, many book chapters and editorials, CDC surveillance reports, and I have edited four books, including the latest

edition of the book Hospital Infections, 6th Edition. Currently, I am a Fellow of the SHEA, the Infectious Diseases Society of America (IDSA), and a member of APIC. I am also the Chairman of the Food and Drug Administration's (FDA's) General Hospital and Personal Use Committee.

I am the recipient of many awards (see Attachment A). Many Public Health Service Awards were for successful investigation of HAI outbreaks. In addition, in 2003, I received the CDC's Lifetime Scientific Achievement Award. This award is given to at most one individual each year. Then, in 2010, I was given the CDC DHQP Lifetime Achievement Award in Epidemiology. That award is given once every 10 years to individuals who have made significant contributions through a lifetime of dedication and productive contributions to infection prevention, healthcare epidemiology, and patient protection.

Since 2003, I have been the President of Jason and Jarvis Associates, LLC. I am responsible for medical consulting in epidemiology, infectious diseases, HAI prevention and control, healthcare epidemiology, protocol design (research), survey/study design and conduct and analysis, and public health. In addition, I provide legal expertise in the areas of healthcare epidemiology, infection control, and infectious diseases.

I have extensive experience in developing HAI surveillance systems and definitions, conducting epidemiological studies and outbreak investigations. My experience that is particularly relevant to this case include: being an author of the CDC HAI definitions—including of the definition of "surgical site infection" (Garner, Horan); being an author of the CDC Guideline for Prevention of Surgical Site Infection (SSI) (Mangram); helping establish the current CDC HAI surveillance system by being Assistant Chief, the NNIS system—the precursor to the current NHSN surveillance system (Jarvis); and being in charge of the HIP/DHQP's HAI epidemiological studies and outbreak investigations.

For approximately 17 years (from 1985-2002), I was responsible for the supervision of all of the CDC HIP's outbreak investigations in healthcare facilities (i.e., inpatient, outpatient, acute care, long-term care, surgicenter, dialysis center, etc.), epidemiological studies of HAIs, and for the development of HAI/infectious diseases prevention guidelines. My experience with investigation of outbreaks in healthcare settings is particularly pertinent and noteworthy. **During this period, I was responsible for more outbreak investigations than anyone else in the world.** Using a systematic approach to these investigations, my team and I investigated >200 on-site investigations and provided guidance on thousands of other outbreaks. Throughout this work, my team and I developed a systematic methodology to investigate infectious disease outbreaks or other complications associated with healthcare delivery. This methodology is centered around a systematic epidemiological-based approach to the investigation of infectious disease outbreaks.

The ultimate goal of each of our investigations was to identify the most likely cause of the outbreak, describe the risk factors associated with the infection/complication, and introduce control measures to prevent the infection/complication from occurring. Two different approaches are commonly used to investigate infectious disease or other HAI outbreaks: 1) the quick and dirty investigation, which often includes conduct of extensive culture surveys to identify the outbreak source or 2) conduct an epidemiological investigation with subsequent epidemiology-directed environmental or personnel cultures or assays (i.e., epidemiological investigation with laboratory confirmation). Experience derived from our team-led investigations throughout the years established that the former ''shot-gunning'' approach creates

superfluous work and can be counterproductive because risk factors or environmental reservoirs that are epidemiologically relevant might be missed altogether or the wrong (or no) source identified. Using the systematic epidemiological investigation combined with directed cultures/testing led to the identification of the cause of all of the on-site investigations we conducted during my 17 years of supervision of this activity.

Results of these outbreak investigations provide evidence that the epidemiology-directed approach is more accurate, efficient, and less costly for identifying the source and mode of transmission of pathogens and for terminating the outbreak. For certain HIP–conducted outbreak investigations, subsequent laboratory studies indeed confirmed the epidemiological findings. However, my team and I often had to draw conclusions based solely on the epidemiological findings without laboratory confirmation because relevant microbiologic specimens were discarded before the decision to conduct a formal investigation was made. Our team's outbreak investigations established that culture surveys of personnel or the environment without a prior epidemiological investigation can be misdirected, expensive, or a waste of laboratory resources and therefore should not be performed before comparative epidemiological studies are completed. Our team's approach of integrating epidemiology and microbiology remains vital to conducting a successful outbreak investigation. This combined epidemiological-laboratory investigation approach has become the "gold standard" methodology used by others at CDC, DHQP, State Health Departments and by healthcare epidemiologists throughout the world as the best way to investigate outbreaks of infectious or non-infectious complications associated with healthcare delivery. Thus, in researching and preparing this report, I have used this second methodology, the exact same methodology that I used and found effective in my work at the CDC.

Although the basic epidemiological methods used to identify and characterize risk factors associated with HAI outbreaks has remained essentially the same throughout the past 45 years, the overall approach to planning and executing outbreak investigations has evolved substantially. From early on, experience obtained from our HIP/DHQP, CDC team's outbreak investigations demonstrated that, although inadequate infection control practices almost always play a role in transmitting pathogens, HAI outbreaks invariably occur when multiple adverse events (inadvertent or even intentional) go unchecked, occur sequentially, or occur simultaneously. Such events can involve a complex interplay of factors (e.g., unsatisfactory infection control practices by healthcare workers, fluctuating nurse- to-patient ratios and staffing levels, or incorrect device use or sterilization), and these factors have led to the transmission of HAI outbreak pathogens becoming more complicated and difficult to characterize. CDC and other investigators have therefore had to adapt by integrating epidemiology, basic sciences, microbiology, molecular typing, engineering, and advanced statistical methods when conducting HAI outbreak investigations. A testimony to the success of our HIP/DHQP, CDC team's systematic approach is that over the 17 years we identified the source and terminated the outbreak in 100% of the on-site investigations we conducted. For the period 1990-2000, we performed 124 on-site investigations of HAIs or other complications associated with healthcare delivery (Archibald). Almost all of the on-site HAI outbreaks we investigated during this decade or over the 17 years I supervised this activity were published in peer-reviewed publications such as the New England Journal of Medicine, Journal of the American Medical Association, Lancet, the Journal of Infectious Diseases, the SHEA and APIC journals, etc.

In addition to my experience investigating HAI outbreaks, I have extensive experience developing HAI surveillance definitions and designing HAI surveillance systems (Garner, Horan, Jarvis). I was involved in the development of the CDC definitions of SSI and was an author of the papers outlining these definitions (Garner, Jarvis). I have extensive experience in the identification of SSIs using interpretation of clinical and/or laboratory findings, both through the surveillance system, in epidemiological studies and through outbreak investigations. It is crucial that surveillance systems, epidemiological studies, and outbreak investigations use SSI definitions that are consistent and standardized; otherwise, inaccurate or uninterpretable SSI rates will be computed and reported. During my tenure at the CDC, we, through the CDC's HAI surveillance system using a systematic approach, developed standardized surveillance criteria for defining SSIs (Figure 1). By these criteria, SSIs are classified as being either incisional or organ/space (Garner, Horan). Incisional SSIs are further divided into those involving only skin and subcutaneous tissue (superficial incisional SSI) and those involving deeper soft tissues of the incision (deep incisional SSI). Organ/space SSIs involve any part of the anatomy (e.g., organ or space), other than incised body wall layers, that was opened or manipulated during an operation.

Currently, as President of Jason and Jarvis Associates, LLC, I consult on prevention of HAIs and infectious diseases throughout the world. I consult for individual hospitals, hospital systems, CDC, Ministries of Health, national and international infection control societies, medical device and product manufacturers, and serve as a medical expert in legal cases (Attachment B--see attached list of cases in which I have provided a deposition or trial testimony). I have provided depositions or trial testimony regarding a number of infectious diseases issues and have been accepted as a medical expert in these cases without exception. I continue to use the same, scientifically rigorous and generally accepted systematic investigative approach I used while I was at the CDC. My fee schedule, which sets forth my compensation for work as an expert witness, is attached hereto as Attachment C.

II. Basic Microbiology, Infectious disease, and Sources of Prosthetic Joint Infections

The risk of an SSI occurring is dependent upon three factors: 1) the pathogen; 2) the patient, and 3) the mode of transmission. No SSI will occur, regardless of the patients' risk factors, if a pathogen is not present at the site. Although theoretically any pathogen gaining access to the surgical site can cause an SSI, the most common pathogens causing SSIs are bacteria, specifically *Staphylococcus aureus* (30.0%), Coagulase-negative staphylococci (CNS; 13.7%), Enterococcus spp. (11.2%), *Escherichia coli* (9.6%), or *Pseudomonas aeruginosa* (5.6%) (Hidron 2008, Hidron 2009). *S. aureus* and CNS are common organisms found on the skin of humans. Each of these and other infecting pathogens can arise from an endogenous or exogenous source. Endogenous sources include the patients' own flora—from their skin, mucous membranes, gastrointestinal tract, or seeding from a distant focus of infection. Exogenous sources include: (1) the surgical personnel (surgeon and team) through their soiled attire, breaks in aseptic technique, or inadequate hand hygiene; (2) the operating room (OR) physical environment and ventilation; or (3) tools, equipment, machines, or other materials brought to the OR or into the operative field.

Patients have a wide variety of risk factors that can increase the risk of an SSI if a pathogen contaminates the surgical site. These risk factors can include: age (i.e., old and very young), diabetes, nicotine use, steroid use, malnutrition, obesity, prolonged pre-operative stay,

pre-operative nares colonization with *Staphylococcus aureus*, infections at a remote body site, being immunocompromised, etc. Again, it should be emphasized that none of these patient-specific characteristics causes the infection; the pathogen causes the infection. These patient risk factors just increase or decrease the risk of infection if a pathogen contaminates the surgical site.

Last is the mode of transmission. Exogenous sources account for the majority of SSIs. Surgical personnel, instruments, equipment and the OR environment can be the source of the pathogen. Transmission can be through direct contact (i.e., hand or intrinsically contaminated instrument/solution touches the surgical site) or via indirect contact (contaminated air or extrinsically contaminated hand or instrument/solution contacts the surgical site). Many interventions are made to reduce the risk associated with these exogenous sources. They include: (1) instrument/solution sterilization; (2) requiring OR personnel to perform extended hand hygiene and wear appropriate clothing to protect the patient from surgical staff flora (i.e., gowns, gloves, face masks, hats, etc.); and (3) minimizing the number and movement of surgical personnel and their entry/exit from the specially ventilated OR. Each person sheds approximately 10^9 skin squames daily; 10% are <10 um and each skin squame is capable of carrying four bacteria. For this reason, the number and movement of personnel is minimized and the OR heating ventilation and air conditioning (HVAC) system is optimized with high efficiency particulate air (HEPA) filtration, 20-25 air changes per hour, appropriate air temperature and humidity, and in some instances directional or laminar air flow to reduce the risk of airborne contamination of the surgical field. All of these measures to reduce the risk of pathogen transmission are critical, particularly in prosthetic joint arthroscopy (PJA) procedures, as the implant can provide a nidus for bacterial adherence. Bacterial colonization can lead to biofilm formation, a proteinaceous covering, which protects the bacteria from antimicrobial therapy and the patient's immune system. Thus, PJA SSIs can be very difficult to treat and the implant must often be removed for successful antimicrobial treatment.

There are various primary and secondary sources of bacteria that can lead to prosthetic joint infections (PJIs). The primary reservoirs of bacteria in the room are the people, that is, the OR staff and the patient (Whyte 1988). The concentration of bacteria in the OR air is proportional to the number of people and their activity (Lidwell, 1967; Hambraeus) and it is therefore the surgical team, rather than the patient, who disperse most of the airborne bacteria. (Whyte 1988). It is well known that the surgical personnel in the OR shed skin squames and can increase airborne bacterial concentrations in the OR. In one study (Whyte 1976), a person wearing a cotton suit commonly used in the OR released a median number of 1,338 bacterial particles per minute into the OR air. In another study (Suzuki), the particle counts increased from 1.1 to 42.5 colony forming units (CFUs)/m^2/min (39 times increase) measured by split sampler and from 1.5 to 17.4 CFU/m^2/min (12 times increase) in an empty vs. in-use OR. Organisms released by OR personnel vary widely by type and amount, but can include CNS, *S. aureus*, *Haemophilus influenzae*, *Neisseria meningitidis*, or *Streptococcus pyogenes* (Group A Streptococcus or GAS). Importantly, these particles generally fall or settle quickly and contaminate the environment (especially on the floor).

Secondary sources of pathogens that can get to the sterile wound and result in PJIs are from equipment/devices which can become contaminated with bacteria from the primary reservoirs (Whyte 1988). A recent vivid illustration of this is the worldwide outbreaks of *Mycobacterium chimaera* SSIs following cardiac surgery that have been linked to heater-cooler units (HCUs), which will be discussed in more detail in Part VII, below. ***The infections***

associated with HCUs are the result of contaminated exhaust air causing contamination of the OR air and specifically the "sterile" surgical site in cardiac surgery patients. Following several investigations documenting the mechanism of these SSIs, the CDC and their Healthcare Infection Control Practices Advisory Committee (HICPAC) have expressed strong concern about any air blowing devices in the OR. HICPAC has therefore recommended that "nothing that blows air should be in an operating theater, if possible" (CDC-A, B, C). The Bair Hugger FAW is a similar type of secondary reservoir in that it uses non-sterile air in its air intake and then further contaminates that air within the device, which it subsequently exhausts into the blanket near the "sterile" surgical field.

III. Surgical Site Infections

According to the CDC, in 2006, ~80 million surgical procedures were performed in U.S. inpatient and outpatient/ambulatory care settings (Berrios-Torres). Between 2006 and 2009, SSIs complicated ~1.9% of all surgical procedures performed in the United States. This estimated number of SSIs is likely an underestimate, since ~50% of these SSIs only become evident after healthcare setting discharge. From January 2009 through December 2010, SSIs accounted for 23% of the 69,475 HAIs reported by 2,039 hospitals to CDC's National HAI surveillance system—NHSN (Berrios-Torres). Variations in the surveillance definition of an SSI, combined with inconsistencies in diagnostic related group (DRG) coding, and variations in post-discharge SSI surveillance, makes it difficult to evaluate or compare interventions and track secular trends in SSI rates.

The identification of an SSI involves interpretation of clinical and laboratory findings, and it is crucial that a surveillance program use definitions that are consistent and standardized; otherwise, inaccurate or uninterpretable SSI rates will be computed and reported. During my tenure at the CDC, we, through the CDC's HAI surveillance system, developed standardized definitions for SSIs (Figure 1) and standardized surveillance protocols for detecting and reporting SSIs (Garner, Horan).

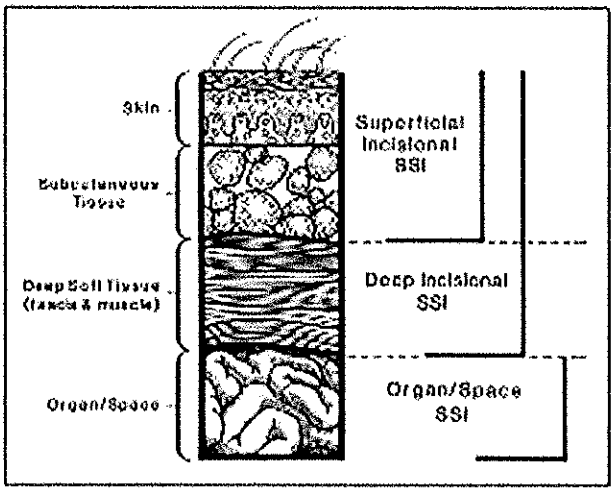

Figure 1. Cross-section of abdominal wall depicting CDC classifications of surgical site infection.

By these criteria, SSIs are classified as being either incisional or organ/space. Incisional SSIs are further divided into those involving only the skin and subcutaneous tissue (i.e.,

superficial incisional SSI) or those involving deeper soft tissues of the incision (i.e., deep incisional SSI). Organ/space SSIs involve any part of the anatomy (e.g., organ or space), other than incised body wall layers, that was opened or manipulated during an operation.

SSIs result in increased morbidity, mortality, and direct and indirect costs including increased hospital length of stay, readmission, repeat surgical procedures, outpatient/emergency room visits, additional medications (i.e., antimicrobials), lost productivity, temporary or permanent disability, and even death. Actual attributable costs of SSIs are difficult to determine. SSIs are very costly to the patient, the hospital, and the healthcare system. Estimated average attributable SSI costs range from $10,443 to $25,546 per infection. However, the costs of PJIs can exceed $90,000. The most common pathogens causing SSIs are common human skin organisms—*S. aureus* and CNS, but infecting pathogens can vary by site of the procedure.

Risk factors for SSIs include both patient-related (i.e., co-morbidities) and procedure-related factors. Patient-related risk factors include: age, gender, weight (obesity), underlying diseases (i.e., diabetes, immunosuppression), etc. Procedure-related factors include patient skin preparation, duration of the procedure, surgical technique, OR personnel, and air handling/ventilation, etc. Although there are overall general SSI risk factors, numerous studies have shown that there are also procedure-related risk factors (i.e., vascular vs. cardiac vs. orthopedic procedures) (see discussion of prosthetic joint procedure SSI epidemiology and risk factors below). As discussed below, a large number of pre-operative, intra-operative, and even post-operative interventions are implemented to reduce or eliminate these SSIs. It should be emphasized that these risk factors do not cause a SSI or PJI. **For a SSI/PJI to occur, contamination of the wound must occur.** The risk factors just increase/decrease the likelihood that an infection will occur if such contamination occurs.

A wide variety of interventions are implemented to reduce the risk for an SSI. In order to cause an SSI, pathogens--usually bacteria--must enter the surgical wound. These bacteria can arise from a variety of sources including the patients' own skin flora, skin flora of OR personnel, contaminated equipment, solutions, or personnel protective equipment in the OR, or OR air. Thus, a variety of interventions or SSI Prevention Bundles of evidence-based practices have been developed and implemented. These include interventions aimed at the patient, the OR environment, OR equipment, and the OR healthcare personnel practices.

To reduce the risk of infection associated with the OR environment and equipment a number of interventions are implemented. Special handling (i.e., HEPA or other filtration) of the air entering the OR reduces the microbial flora in the air (in high risk prosthetic joint procedures some even use directional or laminar air flow to further reduce OR-contaminated air from circulating into the operative field). Keeping the OR doors closed and reducing/minimizing the number of surgical personnel in the OR and the frequency of entry/exiting of personnel reduces the microbial flora that these personnel disperse into the environment/air and reduce air from outside the OR from entering and mixing with OR filtered air. Insuring appropriate sterilization of equipment, instruments, solutions, etc. having potential contact with the surgical field reduces the risk of external contamination of the operative wound. Minimizing the equipment in the OR that is outside the operative field and ensuring that exhaust from such equipment does not impact the operative sterile field reduces the risk of contaminated air or fluids entering the operative field and contaminating the surgical wound. Appropriate cleaning of the OR between procedures

and at the end of the day, reduces the microbial contamination of walls, floors, surfaces and equipment in the OR.

Healthcare (OR) personnel practices to reduce the risk of SSI include appropriate pre-operative hand hygiene, wearing appropriate sterile personnel protective equipment (i.e., gowns, gloves, masks, hoods), reducing the number and movement of OR personnel, insuring good surgical technique, shorter duration of the procedure, and proper hemostasis. The OR staff interventions are implemented to reduce the microbial burden on OR personnel, decrease the dispersal of OR personnel skin flora, and thereby reduce surgical field/wound potential contamination in the OR.

Data from the CDC's NHSN have demonstrated that surgical-procedure specific and surgeon-specific SSI rates are essential. One cannot generalize from one surgical procedure (i.e., cardiac or general surgery) to another (orthopedic or specifically to total knee arthroplasty [TKA] or total hip arthroplasty [THA] procedures). The CDC's NHSN collects data for general risk factors for an SSI (i.e., procedure, wound class, duration of the procedure, and severity of illness of the patient measured by American Society of Anesthesiologists [ASA]). However, this risk index does not predict SSI risk very well for homogenous procedures—such as TKAs or THAs. Furthermore, procedure-specific risk factors, defined by peer-reviewed studies, are not collected in the CDC NHSN surveillance system.

Studies of the epidemiology of SSIs have documented that a large number of evidence-based preventive interventions aimed at the patient, OR environment/equipment, and OR personnel can be implemented and markedly reduce the risk of an SSI occurring after a surgical procedure.

IV. Peer-Review Literature Demonstrating Problems with the Bair Hugger

When considering the potential risk to patient safety posed by a medical device, it is helpful to review the experimental evidence which has appeared in clinical peer-reviewed publications over the years. In doing so, I have reviewed a significant amount of peer-reviewed published scientific material which supports the conclusion that the Bair Hugger Forced Air Warmers (FAWs) have: inadequate air filtration efficiency, internal bacterial contamination (including intake and exhaust hoses), exhaust microbial contaminants, interfere with OR airflow (directional or non-directional), and can introduce particles/microbial contaminants into the surgical "sterile" field.

Several of the studies discussed below have documented that the Bair Hugger FAW intake air filter does not adequately filter the air (unlike a HEPA filter would do), that the internal device and intake and exhaust hoses become bacterially contaminated, and that the hoses exhaust contaminated air.

Each of the Bair Hugger models has an air intake on the bottom of the device. Thus, the ambient air withdrawn into the device is from the non-sterile floor area (some devices can be elevated and obtain their air from the non-sterile ambient air above the floor). This air passes through (and reportedly around) a filter, is heated in the device (when on), and is exhausted through an output hose and through a blanket onto the surgical patient. Given this design, how might the Bair Hugger FAW impact the OR air and environment?

First, the air pulled into the Bair Hugger FAW device is non-sterile ambient air from below the OR table, and often directly from the floor area. Published literature (Albrecht 2010) and experts' reports (e.g.., Dr. David's report) have found that 3M chose to drastically decrease the filtration efficiency on Bair Hugger FAWs. The fact that these devices do not use a HEPA filter concerns me because, as illustrated by a number of studies, the devices then exhaust bacterially-contaminated air into the area of the surgical field. This adds support to my opinion that use of the Bair Hugger increases the bacterial load reaching the surgical site.

For example:

- Albrecht et al. showed that 58% of the FAWs tested were internally generating and emitting airborne contaminants with microorganisms detected on the internal air path surfaces in 92.3% of these blowers. Isolates of *Staphylococcus aureus* (13.5%), CNS (3.9%) and methicillin-resistant *S. aureus* (MRSA; 1.9%) were detected in the FAW blowers (Albrecht 2011).
- Reed et al. documented that the intake air filtration of the Bair Hugger model 750 was found to be 63.8%. In this study, cultures from 100% of the FAWs were positive; CNS, mold and micrococci were identified. Particle counting showed that 96% of the FAWs were emitting "significant levels" of internally generated airborne contaminants out of the hose end (Reed).
- Avidan et al. tested nine Bair Hugger and one Warm Touch FAWs. Agar plates placed directly in the air stream grew pathogenic organisms from four of the units (3/4 were Bair Hugger FAWs). Organisms recovered include CNS, Corynebacterium spp., *Aspergillus fumigatus*, and *Cryptococcus albidus*. Sites swabbed that were culture positive were from the outside of the filter, proximal hose, and the distal hose. (Avidan).
- Albrecht et al. cultured 25 in-use Bair Hugger FAWs and found that 24% of the FAWs blowers were emitting significant levels of internally generated airborne contamination in the 0.5 to 5.0 micron size. Microorganisms were detected in the internal air pathways of 94% of the blowers. (Albrecht 2009).

These studies show that the Bair Hugger filter efficiency is much lower than indicated, that the intake hose, internal units, and output hose can be culture positive with pathogenic organisms, and that air blown through these devices can produce contaminated air. Operating instructions from the Bair Hugger manufacturer do not provide a method for decontaminating the inside of the hose or blower.

A number of studies have assessed the impact of the Bair Hugger FAWs on OR air particulate counts and/or microbial CFUs.

- Albrecht et al. measured the emission of viable and non-viable airborne contaminants of the FAW blowers (Albrecht 2009). They found that Bair Hugger blower surfaces were contaminated with pathogens and that they blow a large number of particles into the sterile field.

- Albrecht et al. also assessed the filter efficiency of Bair Hugger 505, model 200708D and model 200708C 0.2 micron intake filters obtained from the manufacturer (Albrecht 2011). They found that the intake filter retention efficiency at 0.2 microns was 93.8% for the 200708C filter and 61.3 % for the 200708D filter. Fifty-eight percent of the Bair Hugger blowers were internally generating and emitting airborne contaminants, with microorganisms detected on the internal air path surfaces of 92.3% of the blowers. *S. aureus*, CNS, and MRSA were detected in 13.5%, 3.9% and 1.9% of the Bair Hugger blowers, respectively. These authors found that an inadequate filter was allowing microbes into the Bair Hugger and also detected re-introduction of these contaminants into the blower air stream. They concluded that "the design of popular FAW devices using the 200708C filter was found to be inadequate for preventing the internal buildup and emission of microbial contaminants into the operating room."
- Reed et al. assessed the efficiency of the intake filters of Bair Hugger model 750 and found the intake filter to be 63.8% efficient (Reed). Swabbing detected microorganisms within 100% of the Bair Hugger blowers. Distal hose end air stream particle emissions were well above what would be expected based on intake filter performance; 96% of the Bair Hugger blowers were emitting significant levels of internally generated airborne contaminants out of the exhaust hose end and they calculated that 82,500 particles per second were being emitted from the Bair Hugger hose ends. When the 23 Bair Hugger FAW blowers were tested in an OR, they were found to generate particulate counts ranging from 150 to 39,000 (median 4,400) particles >0.3 micron/cu ft. These authors concluded that there was a "need for upgraded intake filtration, preferable high-efficiency particulate air filtration (99.97%) . . . to reduce contamination buildup and emission risks."

These studies document that the Bair Hugger FAW filters are inadequate and that this leads to internal machine and intake and exhaust hose contamination with potential pathogens that are then released out the exhaust hose leading to both particulate and pathogen contamination of the sterile surgical field.

Others have assessed the impact of Bair Hugger FAWs on OR air or ventilation performance.

- McGovern et al. used neutral-buoyancy detergent bubbles released adjacent to a mannequin's head and at the floor level to assess particulate and air currents during a simulated hip replacement in an OR (McGovern). Bubble counts over the surgical site were greater when Bair Hugger FAWs (models 540 and 525) were used compared to conductive fabric warming. Bair Hugger FAWs generated convection currents that mobilized floor air into the surgical site area.
- Legg et al. assessed the impact of Bair Hugger FAWs on the temperature and particles over a simulated lower limb arthroplasty procedure with a human volunteer (Legg 2012). They found that the Bair Hugger FAW significantly increased the temperature (1.1°C vs 0.4°C, $p<0.0001$) and the number of particles (1,038.2 vs 274.8, $p = 0.087$) over the surgical site compared to radiant warming.

- Dasari et al. assessed whether the floor-to-ceiling temperatures around a draped mannequin in a laminar-flow theatre differed with a Bair Hugger FAW (Model 525) blanket, an over-body convective blanket, or an under-body resistive mattress (Dasari). With the Bair Hugger FAW, the mean temperatures were significantly elevated over the surgical site vs. the other technologies. The authors concluded that Bair Hugger FAWs "generates convection current activity in the vicinity of the surgical site."

- Belani et al. assessed the release of neutral-buoyancy detergent bubbles in the head-side region of the anesthesia drape (low vs. high) of an OR with downward displacement used for orthopedic surgery and tracked the bubbles when Bair Hugger FAW (model 540), conductive fabric, or no device was used (Belani). They found that the direct mass-flow exhaust from the Bair Hugger FAW generated hot air convective currents that mobilized significantly more bubbles (average: 132.5 FAW vs. 0.48 conductive fabric [$p = 0.003$] vs. 0.01 for control conditions [$p = 0.008$]) across both drape heights. The authors concluded that excess heat from forced air warming resulted in the disruption of ventilation airflows over the surgical site.

- Legg et al. used neutral-buoyancy helium bubbles and particles created using a Rocket PS23 smoke machine positioned below the OR table to demonstrate the impact of the excessive heat from FAWs (Legg 2013). They used the same OR, devices, and controls as previously used (Legg 2012). The Bair Hugger FAW waste heat increased the air temperature on the surgical site of the drape by >5°C. The convection currents rose against the downward unidirectional airflow causing turbulence over the patient and increased particle concentrations by 2000-fold (2,174,000 particles/m^3 for Bair Hugger FAW vs. 1,000 particles /m^3 for radiant warming and 2,000 particles/m3 for controls) by drawing potentially contaminated particles from below the OR table into the surgical site.

- Sessler et al. evaluated the air quality in laminar air flow ORs at two hospitals using a "volunteer patient and heated mannequin surgeons" by assessing tracer background particle counts near the putative surgical site with a FAW blower (Bair Hugger model 522 and 635) set off, blowing ambient air, and blowing warm air (Sessler). The mean particle counts were higher at both institutions when the Bair Hugger FAW was on vs. off (mean 6.7 vs 9.0/9.4 and 26 vs 161.9/102.6).

- Dr. Elghobashi, using high-fidelity, large-eddy simulation (LES) to assess the interaction of the OR ultraclean ventilation air flow and the flow created by the Bair Hugger FAWs found that the Bair Hugger FAW hot air generated forced convective currents and strong thermal plumes that disrupted the directional clean air ventilation and produced large levels of turbulence under the operating table bringing contaminants from the floor area into the "sterile" surgical field (Dr. Elghobashi report).

Thus, these studies document that Bair Hugger FAWs generate excess heat that disrupts OR air (directional or non-directional) and produce convection currents that can circulate contaminants via the airborne route from the floor or other areas into the area of the sterile surgical field.

In addition, there are a number of publications linking Bair Hugger FAWs with infections.

- Bernards et al. investigated two outbreaks of multidrug-resistant *Acinetobacter baumannii* in their intensive care unit (ICU) (Bernards). They identified the Bair Hugger FAW as one of the medical devices that were involved in the outbreaks. They reported that they "found contaminated dust in the interior of different types of machines used by patients." They also reported that "The Bair Hugger is designed to create an airflow; dust is sucked into the machine, with filters becoming contaminated and possibly serving as a secondary source of transmission." After the removal of the dust and replacement of the filters of the Bair Hugger FAW, the first outbreak was stopped. This study demonstrates the critical function of the filter and its maintenance in preventing the compromise of patients' clean environment protection in the operating theater.
- McGovern et al. evaluated the SSI risk with hip and knee replacement surgeries and found an increased SSI rate (Odds Ratio = 3.8, p = 0.024) during a period when FAWs were used compared to when conductive fabric warming was used (McGovern).
- Wood et al. reviewed the published experimental and clinical research into the issue of the Bair Hugger's infection risk (Wood). In light of the hazards raised by the product, the authors recommended that facilities explore the use of alternative warming technologies in ultraclean orthopedic procedures.

These studies document that the SSI risk associated with Bair Hugger FAWs is not just theoretical, based upon studies showing that: 1) the device intake air is not sterile; 2) the device intake air filter is not HEPA-filtered and the filter used has been shown to be inadequate to filter out bacterial contaminants; 3) studies have shown that the internal device and intake and exhaust hoses (and the air they exhaust) are contaminated; 4) the air exhausted from the device has high particulate counts and bacterial CFUs—i.e., it is contaminated; 5) the exhaust air and excess heat both lead to particulate and airborne bacterial contamination of the sterile surgical field; and 6) particulate and bacterial contamination of the sterile surgical field can led to infection.

Some have argued that even if the Bair Hugger FAW air output/exhaust to the blanket is bacterially contaminated, as documented in many studies above, the blanket itself would serve as a secondary method of filtration to prevent these contaminants for reaching the surgical site. There are no data to substantiate this claim. Furthermore, there are data to show that this is not correct. First, the studies above used the Bair Hugger FAWs with the exhaust hose connected to the blanket (and in normal use) and still found elevated particle counts and CFU in the OR air and near the "sterile" operative field. Second, a meeting presentation from M.D. Anderson Cancer Hospital in Houston, Texas clearly showed there is no secondary filtering when their Bair Hugger FAW inadvertently became wet in the OR during a patient's surgical procedure (Tsai). The engine inside the machine began to burn and the resulting electrical burning soot was blown from inside the Bair Hugger FAW, through the exhaust hose, and then through the blanket to the patient. Evidence of this soot being transferred from the Bair Hugger FAW internal engine to the patient was illustrated by the soot marks pictured on the skin of the patient in the pattern of the Bair Hugger blanket holes. Thus, there are data to visually illustrate that the Bair Hugger FAW blankets are not secondary filters of the exhausted air.

These studies provide substantial evidence of the patient safety risk posed by the Bair Hugger FAWs. While the individual results of these studies are not definitive, collectively they firmly support the following contentions:

1. Bair Hugger FAW machines inadequately filter non-sterile ambient air;
2. Bair Hugger FAW internal surfaces (i.e., machine, intake, and exhaust filters) become contaminated by microbes from the ambient air in the OR;
3. Bair Hugger FAWs exhaust this contaminated air into the OR/sterile surgical field through the exhaust hose and the blanket;
4. Bair Hugger FAWs markedly increase the bioburden (i.e., particulates and CFUs) of the OR directly (via exhaust air) and indirectly by disruption of OR air ventilation (directional or non-directional) through the excess heat produced; and
5. Bair Hugger FAWs promote circulation of microbial contaminants into the "sterile" surgical field.

I have also reviewed literature that has been promoted by the Defendant as supporting the safety of FAWs in orthopedic surgical procedures. However, these studies are not convincing on this issue.

- Zink et al. studied eight volunteers who lay on an OR table with their lower bodies and legs covered with a warming cover and sterile drape (Zink). Convection warming was administered for two hours and then no warming for two hours. Culture plates were placed directly on the volunteers' abdomens through an opening in the drape. This study appears to have used new uncontaminated blowers and it was not conducted under actual surgical conditions. In light of the date of the study, the test appears to have been conducted with Bair Hugger Model 500 series units with lowered airflow and the original filter instead of the reduced efficiency model. It does not appear that any surgeons, other OR staff, equipment or any flow obstructions were in the room. Despite this, they still detected bacterial contamination on 2/8 (25%) of the culture plates.
- Huang et al. analyzed air and wound cultures for bacterial content at the beginning and end of surgery from 16 patients undergoing abdominal vascular prosthetic graft insertion procedures (Huang). The study was underpowered to detect a difference in SSIs, did not involve orthopedic surgical patients, was not a controlled study, and was not conducted in OR with directional or laminar flow ventilation.
- Moretti et al. studied the bacterial contamination of air in the OR during 30 female patients (20 with use of the Bair Hugger FAW) undergoing non-cemented hip implantations using an Active Surface Air (SAS) sampler and a single culture plate (Moretti). The study was not randomized, it was not conducted in an OR with directional or laminar flow ventilation, and used a less sensitive air sampler. Despite these limitations, the study still did document an increase in mean bacterial load values when the Bair Hugger FAW was employed. The sample size was too small to detect a difference in SSI risk and the authors concluded that "further studies are needed."

- Sessler et al. evaluated air quality in two hospital's laminar air flow ORs using a volunteer "patient" and heated mannequin "surgeons" (Sessler). This study was sponsored by and the publication edited before journal submission by the Defendant. Neither Dr. Sessler nor Mr. Olmstead (first and second authors on the study) was involved in the design of the study, and they were not at the hospitals in Holland when the study was performed, and were not involved in the initial analysis of the data. Nevertheless, this study did find elevated particle counts when the Bair Hugger FAWs were on with either blowing of ambient air or warmed air vs. no FAW use. The mean particle counts with the Bair Hugger 522 model were: 6.70 when off vs. 9.00 when on ambient vs. 9.40 when on warm. The mean bacterial counts for the Bair Hugger model 635 were 26 when off vs. 161.90 when on-ambient vs. 102.60 when on-warm.

- Dr. Elghobashi performed high-fidelity, large-eddy simulation (LES) to study the interaction of the OR ultraclean ventilation air flow and the flow created by the Bair Hugger FAWs. He used a full three dimensional design of an OR with an operating room table, surgical lamps, surgical staff, side tables, a FAW and a patient undergoing knee surgery. Two computation models were performed with the blower-off and the blower-on. The FAW hot air generated forced convective currents and strong thermal plumes that interacted with the clean air ventilation. He placed 3 million squames (10 micron diameter) on the floor in a small region surrounding the operating table and surgeons. When the FAW blower was on there was significantly modified and large levels of turbulence intensity observed under the operating table. The turbulence intensity levels were as high as 60% in regions affected by the rising thermal plumes from the blower. Drastic differences were seen in the trajectories of the squames when the blower was off vs. on. When the blower was off, the majority of squames were dispersed by the ventilation towards the outlet grills. None of the squames rose to the level of either the side tables or the operating table. In contrast, when the blower was on, large numbers of squames were lifted upwards by the thermal plumes. Some of the squames were lifted above the surgeons' heads and blown towards the operating table. Large numbers of squames were seen surrounding the surgeons' hands, above the side table, and even very close to the patient's knee or surgical site.

In summary, the above data illustrate that: 1) the Bair Hugger intake air filtration is inadequate; 2) the internal device and the intake and exhaust air hoses become contaminated with bacteria; 3) the exhaust hose is directing bacterially contaminated air to the blanket; 4) the exhausted contaminated air and the disruption is not "secondarily filtered" by the blanket and can reach and contaminate the sterile surgical site; and 5) the excess heat produced by the Bair Hugger FAW disrupts the OR air (directional or non-directional) and leads to particulate and bacterial (i.e., CFU) contamination of the "sterile" surgical site. These data are critical in showing that the Bair Hugger FAWs can lead to surgical field contamination and SSIs.

V. Particle and Microbial Counts in Operating Rooms and the Impact of Reduced Air Quality in Joint Surgeries

A. *Airborne Particulates and CFU's:*

Using sampling technologies to assess the ambient air in ORs, studies have documented the widespread presence of airborne particulates and microorganisms during surgery.

- Stocks et al used a standard particle analyzer to measure the number and diameter of airborne particulates and an impact air sampler and standard culture plates to identify and count CFU during 22 joint arthroplasty surgeries (Stocks). Particulate density averaged >500,000 particles/m^3 per 10-minute interval and 1,786 CFU were identified, primarily gram-positive cocci. Particle and CFU density increased with longer surgery duration and higher OR staff counts.

- Edmiston et al. performed in situ air-sampling analysis of multiple distances, ranging from 0.5m to 4m, from the surgical wound in the OR (Edmiston 1999, 2005). CNS were recovered from 86% of air samples, 51% from within 0.5 m of the surgical wound, whereas *S.aureus* was recovered from 64% of air samples, 39% within 0.5 m from the wound. When anterior nares swabs were obtained from 11 members of the operative team, clonality was documented between eight strains of *S. epidermidis*, and 2 strains of *S. aureus* collected from the OR staff and the environment.

- Lidwell et al. found a correlation between the mean values of air contamination and the numbers of bacteria isolated from orthopedic surgical wound wash-out samples (Lidwell 1983). They concluded "that by far the largest proportion of bacteria found in the wound after the prosthesis had been inserted reached it by the airborne route."

- Andersson et al. assessed the impact of OR traffic patterns on particle counts and CFUs using active air sampling and observations during 30 orthopedic procedures (Andersson). Their data showed a strongly positive correlation between the total CFU/m^3 per operation and total traffic flow per operation ($r = 0.74$; $P = .001$), even after controlling for duration of surgery. There also was a positive correlation between CFU/m^3 and the number of persons present in the OR ($r = 0.22$; $P = .04$). Traffic flow, number of persons present in the OR, and duration of surgery explained 68% of the variance in total CFU/m^3 ($P = 0.001$).

- Darouiche et al. assessed the airborne microorganism CFU at the surgical incision and the impact of using an air barrier system (i.e., intervention) that would reduce particle counts and CFUs at the incision site in total hip arthroplasty, spinal fusion, and vascular surgery patients (Darouiche). They found that the CFU density at the incision site was significantly lower in the intervention group, that the airborne CFU densities were significantly related to the incidence of implant infection, and that the only implant infections that occurred were in the non-intervention group with the higher CFU densities.

Cumulatively, these studies show that airborne particle counts and microbial CFUs can be elevated near or at the operative/incision site and that activities that increase the particle counts/microbial CFUs increase the risk of SSI.

B. *Why Implant/Device Surgeries are Different:*

These and other data show that there are two primary modes of transmission of pathogens causing SSIs. These include direct and indirect contact. Direct contact would involve person to person contact transmission to the surgical site. In contrast, indirect transmission results from contamination of equipment, instruments, solutions, or air that subsequently contaminates the surgical site.

For SSIs, the OR air bacterial load is critically important, as the patients' "sterile" surgical field and surgical site has exposure to this air during the entire length of the surgical procedure. This is particularly important in PJA procedures where an implant is introduced. It has been estimated that rather than large numbers of micro-organisms required to cause many infections, that as few as 1-10 CFUs are required to cause a PJI. Whyte et al. showed that the average air counts in a conventionally ventilated OR was 413 cfu/m^3, but in an adjacent ultraclean OR it was 4 cfu/m^3, a 100-fold drop from one OR to the other (Whyte 1988). When the wound was washed out just before closure an average of 105 bacteria was found in the wounds in the conventional OR and 3 bacteria in the ultraclean—a 35-fold drop. They calculated that in the conventionally ventilated OR 98% of the wound bacteria came from the air."

It is for these reasons that CDC and national and international Surgical and OR Environmental Societies have recommended: 1) 20 air exchanges per hour and/or use of directional air flow; 2) minimizing the number of OR personnel, their entry and exit of the OR, and their activities; and 3) "Nothing that blows air should be in an operating theater, if possible". (CDC-A, B, and C). Hospitals spend large amounts of money to design and maintain OR HVAC systems to reduce the microbial burden in the OR air.

The primary portal of entry for pathogens causing PJIs is during the surgical procedure when the wound is open to direct contact (personnel and equipment/instruments) and to the OR air. In order to cause a PJI, pathogens—usually bacteria—must enter the surgical wound. Since in most PJA procedures, the joint/surgical wound is closed at the end of the surgical procedure, contamination of the wound/joint/prosthesis can only happen peri-operatively when the implant and joint space are open and exposed. The previously mentioned studies have shown that the particle counts and CFUs in the OR air increase when the number of personnel increase, OR personnel enter and exit the OR (mixing non-OR air with the filtered OR air), equipment, such as the Bair Hugger FAW, exhaust bacterially contaminated air into the OR, and that the excess heat produced by the Bair Hugger FAW can circulate microbial contaminants below the OR table into the "sterile" surgical field. Such contaminated OR air can contaminate surgical gloves, surgical instruments, implants, and the surgical wound.

PJA patients are extremely susceptible to PJIs. This primarily results not from their underlying conditions, which can contribute to their SSI risk, but because they are having a prosthetic device implanted.

- Foster & Hutt (1960) found that experimental septic skin lesions could be produced by as few as 15 organisms (Foster).
- Whyte et al. have said that: "orthopaedic implant operations are susceptible to a lower dose of a less pathogenic bacteria than many other operations." (Whyte 1988).
- It would appear that in orthopedic implant surgery wound sepsis, the infection may be produced by fewer organisms, even a single *S. aureus* (Lidwell 1983, Whyte 1988).

Any indwelling medical device or prosthetic implant has the potential to become colonized by organisms embedded in biofilm. A biofilm is defined as a sessile community characterized by cells that are irreversibly attached to a substratum or interface or to each other, are embedded in a matrix of extracellular polymeric substances that they have produced, and

exhibit an altered phenotype with respect to growth rate and gene transcription. Biofilm organisms exhibit significant resistance to antimicrobial agents (10 to 1,000 times the minimum inhibitory concentration [MIC]) compared to their free-floating, planktonic counterparts. Mechanisms associated with this increased antimicrobial resistance include delayed or decreased penetration of the antimicrobial through the biofilm matrix, altered growth rate of the biofilm organisms, and/or other physiologic changes due to the biofilm mode of growth. Each year in the United States, approximately 13 million patients experience a biofilm□related infection associated with prosthetic implants or invasive devices.

- Susceptible hosts who are exposed to pathogens during a PJA procedure have different periods of latency (i.e., time from inoculation to signs of infection) before the manifestation of symptoms of infection because such small CFUs of pathogens are necessary to cause the infection and because of the fact that such organisms commonly attach to the prosthetic device, which has no blood supply, and thus the organisms can grow slowly. According to the CDC SSI definitions, any SSI developing in a PJA procedure patient can present within one year. However, the recent HCU outbreaks of *M. chimaera* have shown that the latency period can be measured in years (Chand, Haller, Kohler, Perkins, Robinson, Sax, Soetaert, Sommerstein, and Trudzinski).

- Risk factors for SSIs include both patient-related (i.e., co-morbidities) and procedure-related factors. Patient-related risk factors include: age, gender, weight (obesity), underlying diseases (i.e., diabetes, immunosuppression), etc. Procedure-related factors include patient skin preparation, duration of the procedure, surgical technique, OR personnel and air handling/ventilation, etc. Although there are overall general SSI risk factors, numerous studies have shown that there are also procedure-related risk factors (i.e., those specific for vascular vs cardiac vs orthopedic procedures).

- It is important to note that patient risk factors are not causes of infection because a patient cannot become infected without the pathogen. None of the patient-specific characteristics *causes* the infection. Such factors merely increase or decrease the risk of infection, if wound contamination occurs. The absolute requirement for PJI is contamination of the wound/implant. Without wound contamination, regardless of the patients' risk factors, they will not develop a PJI.

VI. Patient Warming and the Critical Importance of Infection Control in the Operating Room During Prosthetic Joint (Implant) Procedures

A. *Patient Warming and Normothermia:*

It has become common practice for surgeons to ensure normothermia in their patients. However, in my review of the literature in preparation of this report, I could find no clinical evidence supporting the hypothesis that ensuring normothermia reduces PJIs. Anesthesia, anxiety, antiseptic skin preparations, surgical irrigants, skin exposure, and large open surgical wounds in cold ORs can cause patients to become clinically hypothermic, defined as $<36^{o}C$, during surgery. Traditionally, hypothermia was thought of and used peri-operatively as a strategy to reduce cerebral and/or myocardial tissue sensitivity to ischemia. Hypothermia still is nearly universally used in cardiac surgery and selected other procedures. However, in the mid to

late 1990s, several studies suggested that inadvertent hypothermia during surgery could be associated with a variety of complications.

In evaluating the published literature on maintaining normothermia in surgical patients, several issues are important to understand. There are no standardized methods for when and how to measure patient temperature during surgical procedures. Even studies of the impact of hypothermia in surgical patients vary in the way (when and how) that core body temperature is measured. Sites that are accessible during surgery include the axillary, bladder, esophageal, nasopharynx, tympanic, and rectal sites. Some studies suggest that all these sites are not equivalent and accurate measures of core body temperature. The timing of core body temperature measurements also varies. Some measure continuously, some at the beginning and end of the surgical procedure, some before the incision and after return to the post-operative care unit, etc. The timing of these core body temperature measurements for comparative purposes is important. Thus, it is critical when reviewing the peer-reviewed literature to determine exactly how, when, and where the patient's core body temperature is being measured. In addition, virtually all surgical patients experience an initial drop in core body temperature associated with the induction of anesthesia in their first hour in the OR. One method to avoid or attenuate this initial response is to pre-warm surgical patients in the pre-operative area. Most studies of the impact of maintaining normothermia in surgical patients do not do this and so even patients who are being warmed in the OR experience this initial period of hypothermia. The impact of hypothermia (if any) also depends upon the actual change of delta in temperature and its duration. *Virtually no studies have evaluated the extent and duration of hypothermia on adverse events, including SSIs in PJI patients.*

One of the first studies to suggest that maintaining normothermia of surgical patients during the operative procedure was conducted by Kurz et. al (Kurz). In 1996, Kurz et al. conducted a randomized controlled trial (RCT) in which 200 colorectal surgery patients (actually specifically patients scheduled for an elective colorectal surgery for cancer or inflammatory bowel disease) were randomly assigned to routine intra-operative thermal care (i.e., the hypothermia group-core temperature allowed to decrease to approximately 34.5°C) or additional warming (i.e., the normothermia group—core temperature maintained near 36.5°C) using a FAW. The normothermia group also received warmed intravenous (IV) fluids whereas the hypothermia group did not. The authors concluded "that hypothermia itself may delay healing and predispose patients to wound infections. Maintaining normothermia intra-operatively is likely to decrease the incidence of infectious complications in patients undergoing colorectal resection and to shorten their hospitalizations."

It should be noted that this is the only RCT to show a relationship between hypothermia and SSIs. Importantly, this study was only conducted in colorectal surgery patients. Some limitations of this study are: a) it was performed two decades ago when patient care was very different than today; b) the average duration of hospitalization at the time for such patients was 12-14 days vs. 5 days currently; c) in the hypothermia group, a FAW was used on ambient, so the ambient air (reported as 22°C) blowing on the patient may have had an additional cooling effect; d) most SSIs were superficial, not deep; e) the study was underpowered to detect a difference in deep SSIs; f) the average duration of the colorectal procedures was 3-4 hours vs. shorter periods today; g) patients received their "surgical prophylactic antimicrobial" for 3.5 days post-operatively; h) both patient groups experienced hypothermia, but the duration of hypothermia was greater in the hypothermia group; i) only 24 SSIs were detected (6 in the

normothermia and 18 in the hypothermia group); j) SSIs were significantly more common in smokers than non-smokers (23% vs. 7%); k) the normothermia group received warmed IV fluids whereas the hypothermia group did not; and l) the study was conducted in Vienna, Austria.

Dr. Kurz's deposition testimony acknowledges that this study's data are out of date, that this study probably would not be accepted for publication today, and that the surgical patients have much shorter durations of pre-operative hospital stay and are in better shape for surgery today than in 1996, and that even the surgical procedure itself is very different today than in 1996. In addition, she stated that the majority of SSIs were superficial and not deep SSIs. She also acknowledged that there are no other RCTs evaluating maintaining normothermia and the risk of SSIs (especially deep SSIs) in other surgical groups, particularly in shorter duration procedures such as PJA procedures. She stated that she had not done any studies of maintaining normothermia in PJA patients and she was not aware that anyone had assessed the relationship between normothermia/hypothermia and the risk of SSIs in PJA patients.

Shortly after the Kurz study, a variety of studies (mostly observational or retrospective studies not RCTs) found that maintaining normothermia did not impact SSI rates in a variety of surgical patient groups (Lehtinen, Wong, Barone, Constantine, Baucom, Melton, Kawaraguchi, Brown, and Frisch)

It is also undisputed that there is a wide variety of ways to try to maintain intra-operative normothermia other than the Bair Hugger FAW. These include: a) maintaining an OR temperature of >24°C; b) using warming blankets, head coverings, and/or leggings; c) using warmed infusates/fluids; d) using warmed anesthetic gases; e) using heating mattresses, f) using reflective/conductive blankets; or g) using radiant heat sources. Moreover, several studies have shown that for longer procedures (i.e., >90 min) convective and conductive warming are equally efficacious (Brandt).

In summary, if one reviews the extensive peer-reviewed literature in this area and focuses on the data showing that maintaining normothermia in PJA patients will decrease their SSI risk (i.e., PJI), there are no well-designed RCTs to support this hypothesis. In fact, there are a variety of non-RCTs that suggest that maintaining normothermia vs. allowing inadvertent hypothermia has no impact on the SSI rate in PJA patients.

B. *Infection Control and Avoidance in Prosthetic Joint Arthroscopy (PJA) Procedures and Prosthetic Joint Infections (PJIs):*

PJAs, such as TKA or THA procedures, are a specific subset of all surgical procedures. PJA procedures are surgical procedures that involve a joint (i.e., elbow, shoulder, knee or hip replacement procedures). According to the CDC, in 2011, primary TKA procedures accounted for >50% of the 1.2 million PJA procedures (primary and revision) performed in the United States, followed by THAs (Berrios-Torres).

Contamination of the surgical field during PJA procedures can be catastrophic. In the United States, analysis of the Nationwide Inpatient Sample (NIS) using International Classification of Disease, ninth edition (ICD-9) data between 2001 and 2009 showed a significant increase in the risk of SSI following THAs or TKAs (THA: 1.99% to 2.18% and TKA: 2.05% to 2.18%,) (Kurtz, Jaekel). Between 1990 and 2004, the primary revision and knee arthroplasty infection rate rose from 0.63% to 1.21%. Between 1990 and 2004, the primary

revision and hip arthroplasty infection rate rose from 0.66% to 1.23%. By 2030, the SSI burden associated with THAs and TKAs is expected to increase to 6.5% and 6.8%, respectively. Given both the increasing SSI risk and the increasing number of individuals undergoing PJA, between 2010 and 2020, the total number of THA and TKA PJIs is projected to increase from 25,917 (THA: 8,136; TKA: 17,781) to 65,555 (THA: 16,584; TKA: 48,971).

As previously mentioned, the CDC's NHSN collects data for general risk factors for an SSI, but they do not collect procedure-specific (i.e., PJA) risk factors. Thus, the CDC risk index does not predict SSI risk very well for homogenous procedures—such as TKAs or THAs. In addition, the CDC NHSN has not required post-discharge surveillance. More recently, a large integrated healthcare system (IHCS) used a standard surveillance methodology for TKA and THA procedures from 1999 through 2004, including CDC definitions of SSI; however, they also included post-discharge SSI surveillance (not conducted by most of the CDC NHSN participants and not required by the CDC's NHSN)(Barnes). They compared their PJI rates to those reported by the CDC's NHSN. The IHCS infection rates (hip, 1.7; knee, 2.1) were higher than the corresponding CDC NHSN rates (hip, 1.4; knee, 1.2) (hip, P = 0.006; knee, P = 0.012) when infections detected by the IHCS during the post-discharge period were included.

Treatment of PJIs commonly involves a two□stage procedure, with 4-8 weeks of intravenous/parenteral antimicrobial therapy between the surgical procedures. When eradication of the PJI is not possible, treatment can include arthrodesis—surgical immobilization of the joint by fusion of the adjacent bones—or even amputation. In 2009, data from the NIS indicated that the average hospital cost for a revision of an infected THA or TKA was $93,600 and $24,200, respectively (Kurtz). Between 2001 and 2009, the estimated total hospital costs for treating PJIs increased from $320 million to $566 million, and was estimated to reach $1 billion by 2014 (Kurtz, Jaekel, Cram). Examination of data from the U.S. Medicare population showed that between 1991 and 2010 TKA volume has increased from 93,230 procedures to 243,802 procedures (Cram). The TKA volume increase was driven by both the increased number of Medicare enrollees and the per capita utilization. Primary TKA utilization increased by 99% whereas revision TKAs increased by 51% over this twenty year period. Given the demographics of the U.S. population, it is reasonable to assume that the number of TKA and THA procedures will continue to increase over the next 1-2 decades.

In the OR it is impossible to remove the primary sources of contamination, i.e., the patient on whom the surgery is being performed and the essential OR staff. It follows that if one wishes to prevent the wound from becoming contaminated during the PJA procedure, it is necessary to interrupt the route of infection (Whyte 1988). Because PJA procedures are clean operations, the sources and the possible routes of infection are fewer than in many other operations. (Whyte 1988).

C. *How are the routes of infection managed and controlled in PJA surgeries?*

- To reduce the risk of PJIs associated with the OR environment and equipment, a number of interventions are implemented. Various pre-, peri-, and post-operative techniques have become standard to interrupt routes of infection.

- With regard to the patient, reducing the pre-operative hospital stay reduces the risk of colonization with hospital flora; pre-operative bathing and skin preparation reduces the normal skin flora; screening and decolonization of those colonized with Staphylococcus spp. reduces a source of PJI; and appropriate administration of prophylactic antimicrobials before the incision produces a peak of antimicrobial at the time of the incision and surgery are performed, thereby reducing the risk of surgical wound contaminating micro-organisms from causing an SSI.
- Keeping the OR doors closed and reducing/minimizing the number of surgical personnel in the OR and their frequency of OR entry/exiting reduces the microbial flora that these personnel disperse into the environment/air and reduce air from outside the OR from entering and mixing with OR filtered air.
- Ensuring appropriate sterilization of equipment, instruments, solutions, etc. having potential contact with the "sterile" surgical field reduces the risk of external contamination of the operative wound.
- Minimizing the equipment in the OR that is outside the operative field and ensuring that exhaust from such equipment does not impact the operative "sterile" field reduces the risk of contaminated air or fluids entering the operative field and contaminating the surgical wound.
- OR personnel practices to reduce the risk of SSI include appropriate pre-operative hand hygiene, wearing appropriate sterile personnel protective equipment (i.e., gowns, gloves, masks, hoods), and reducing the number and movement of OR personnel. These practices reduce the microbial burden on OR personnel, decrease the dispersal of OR personnel skin flora, and reduce surgical wound potential contamination in the OR Additional practices include insuring good surgical technique, minimizing the duration of the procedure, and good hemostasis.
- The CDC and HICPAC have expressed strong concern about any air blowing devices in the OR and specifically have recommended "Nothing that blows air should be in an operating theater, if possible." (CDC-A, B, and C).
- Ensure adequately filtered and circulated air in the OR. This may include either directional or non-directional air flow following HEPA filtration. A modern OR is designed to be supplied with "bacteria-free" (HEPA-filtered; removal of 99.97% of particles $\geq$0.3 microns) air of sufficient quantity to pressurize the room against the ingress of non-OR filtered air (i.e., the air is positive pressure compared to the area outside the OR). (Whyte 1988). Special handling (i.e., HEPA or other filtration) of the air entering the OR reduces the microbial flora in the air. In high risk PJA procedures, some even use directional or laminar air flow to further reduce microbial burden of air entering the operating room. Darouiche et al. have documented that using a device to capture potentially contaminated air near the incision site significantly reduces the particulates and CFUs and translates into reduced SSI rates (Darouiche).
- The main purpose of the above prevention interventions is to protect the surgical field and surgical wound from pathogens from the outlined primary and secondary reservoirs.

VII. The Relevance of Heater-Cooler Infections to Bair Hugger FAWs

- In 2013, Archermann et al. published a case report from Switzerland (Archermann). They noted that prosthetic valve endocarditis (PVE) due to slowly growing non-tuberculous mycobacteria (NTM) had not been reported previously. They presented one case of PVE and one case of bloodstream infection caused by *Mycobacterium chimaera* in 2012. Randomly-amplified polymorphic DNA (RAPD)-Polymerase chain reaction (PCR) indicated a relatedness of the two *M. chimaera* strains. Both patients had heart surgery two years apart from each other. **A nosocomial link was not detected.**

- Nearly two years later, Sax et al. described an outbreak of *M. chimaera* SSIs following cardiac surgery at a hospital in Switzerland (Sax). Based upon the Achermann et al. case report, they went back and reviewed microbiology records for patients with *M. chimaera* infections at their hospital. They identified six patients aged 49-64 years with PVE or vascular graft infection due to *M. chimaera*, which became clinically manifest with a latency of between 1.5 and 3.6 years after surgery. In addition, they cultured *M. chimaera* from water circuits of heater-cooler units (HCUs) connected to the cardiopulmonary bypass, and air samples collected when the units were in-use. RAPD-PCR demonstrated identical patterns among *M. chimaera* strains from HCU water circuits and HCU exhaust air samples, and strains in 2 patient clusters. They concluded that the epidemiological and microbiological features of this prolonged outbreak provided evidence for the airborne transmission of *M. chimaera* from **contaminated HCU water tanks to patients during open-heart surgery via exhaust air.**

- Over 250,000 procedures using cardiopulmonary bypass are performed in the United States each year. The implicated HCU devices represent approximately 60% of the U.S. market (Perkins). Yet, despite this large exposure, if it had not been for the fact that the infections were being caused by a very unusual organism, this link between *M. chimaera* infections and HCUs would not have been identified. HCUs had been used in cardiac surgery for decades to regulate patients' blood temperature during cardiopulmonary bypass. Yet, previously infected patients probably had not been cultured correctly for NTM (*M. chimaera,* a slow growing Mycobacteria, would not grow within 3 days which routine wound or blood cultures are incubated for growth).

- Once this link between HCUs and *M. chimaera* infections was established by Sax et al., others throughout the world began to look for these infections. *M. chimaera* infections (e.g., SSIs, endocarditis or bloodstream infections) have been detected and reported from a wide variety of countries around the world, including in the United States, Canada, Belgium, Germany, England, and Australia (Chand, Haller, Kohler, Perkins, Robinson, Sax, Soetaert, Sommerstein, and Trudzinski). None had recognized this association before the Sax et al publication. In some instances, the latency period between the surgery and signs of infection were as long as five years.

- An investigation at the manufacturing plant of one of the HCU devices showed that some of the devices were contaminated at the time of manufacture (intrinsic contamination). In other instances, the devices became contaminated during use (extrinsic contamination) (CDC-A, B, and C).

- Sax et al. also showed that the source of the infections in cardiac surgery patients was not from water used in the device (which has no contact with the patient), but rather was due to aerosolization of the exhaust air from the device. Infections in patients was because this contaminated exhaust circulated into the surgical field—no matter how far the devices were kept away from the operative field. This contamination of the surgical field even occurred when directional airflow was used in the OR. In fact, the only way to ensure that no contaminated air entered the sterile field was to keep the HCU (and its exhausted air) outside the OR in which the surgery was being performed (Sax).

- Only after intensive systematic investigation was the linkage between *M. chimaera* and HCU-associated infections in cardiac surgery patients identified. If one does not look for such a linkage (as was the case for decades as HCUs were used), the source of infections will not be found or recognized. This worldwide outbreak shows us that contaminated exhaust of a medical device used in the OR can lead to SSIs and other infections in surgical patients, even if all the prevention interventions mentioned previous are implemented. Furthermore, this outbreak illustrates that such devices can be used for long periods of time (decades) and unless the infections are caused by a very unusual organism and hospital personnel do the type of outbreak investigation we set as the gold standard, the source will remain unknown.

- The authors of several of the above studies concluded that: "all heater–cooler units should be reliably separated from air that can gain access to sterile areas and instruments, and devices that generate drafts should be banned from the operating room" (Sommerstein). The CDC's HICPAC has stated at their November 2015 meeting that: "It is important not to blow air in the operating theater," and adding, "Nothing that blows air should be in an operating theater, if possible."(CDC-A). Furthermore, CDC has stated: "Had this infection been a more routine organism than *M. chimaera*, it may not have been attributed to the heater-cooler unit. Given the exhaust from these machines in the OR, it would not be surprising to learn that other organisms are aerosolized and deposited in places they do not belong." Dr. Bell, Deputy Director, DHQP further stated: "the ultimate goals are to remove the problems, prevent them in the future, and hold industry accountable to develop safe products."

The Bair Hugger FAWs are very, very similar to the HCUs. In fact, the Bair Hugger FAWs' exhausted air is right next to the surgical field whereas the HCU exhaust was distant to the surgical field. Although they do not use water, the Bair Hugger FAWs draw in non-sterile OR air into their air intake. That air passes through (or around) an inadequate filter that has been shown to permit passage of micro-organisms into the device. Then, that air is heated in a device that has been shown to be internally contaminated. That heated air is then exhausted through a contaminated output hose into a blanket adjacent to the operative field. A blanket that has been shown to transfer soot from a burning device to the skin of a patient. Furthermore, if the contaminated air from the device does not reach the patient's surgical field or wound directly, there is a second mechanism by which the Bair Hugger FAWs can cause serious infections. The excess or waste heat is released under the surgical field and through simple aerodynamics--as illustrated by Dr. Elghobashi's excellent study--those convection currents rise and bring skin squames from the OR staff or other contaminants from the floor into the "sterile" surgical field. In my medical opinion, the mechanism of infection with the Bair Hugger FAWs is virtually identical to that documented with the HCUs.

VIII. The Consequences of Disruption in OR Ventilation for Joint Surgery Patients

Disruption of the air flow in the OR, such as that caused by the Bair Hugger FAW, increases particulates and microbial CFUs in the "sterile" surgical field. A variety of studies have demonstrated what the consequence is of increased particulates/CFUs in the "sterile" surgical field:

- Several studies have demonstrated a correlation between OR airborne bacterial contamination and post-operative PJIs (Gosden, Lidwell 1983, and Lidwell 1987).
- Stocks et al. showed that particulates are a reasonable proxy for airborne bioburden. They showed that there is a correlation between the particle count in the OR air and bacterial contamination (Stocks). In their study, they measured the number and size of airborne particles during 22 PJA procedures using an impact air sampler and settle plates. They found that the number of 10 micron particles/m3 and the number of surgical staff in the OR were associated with the CFU/m^3 at the hip or knee joint surgical site. When they controlled for the number of 10 micron particles/m^3, the number of surgical staff was not related to the CFU/m^3. These data show that the number of particles and CFU increase together and that these particles can reach the surgical field. Traffic flows were not associated with higher particle counts (the OR was under 0.15 inches of water positive pressure). This study shows that particle counts may be an easier, quicker, and indirect but accurate method for detecting bacterial contamination of the OR air and surgical field.
- Darouiche et al. conducted an RCT testing the impact of an air barrier that reduced particulates and CFUs at the incision site and found: 1) that the CFU density at the incision site was significantly lower in the intervention group (i.e., air barrier) than in the control ($P<0.001$); 2) the density of airborne CFU at the incision site during the procedures were significantly related to the incidence of implant infection ($P = 0.021$); 3) that every 10 CFU/m3 increase in the median CFU density approximately doubled the probability of implant infection; 4) that airborne particle counts could be used as a proxy for ambient CFU; and 5) that airborne CFU densities were four times greater in the procedures with implant infections vs. no implant infection. All four implant infections occurred in the control group. The authors concluded that "reduction of airborne CFU specifically at the incision site during operations may be an effective strategy to reduce prosthetic-related infections" and that "airborne CFU entering incisions during operations is a likely source of contamination leading to implant infections." This study demonstrated that particulate counts correlated with microbial counts (i.e., CFUs) and that elevated particulate counts/microbial counts at the incision site were associated with increased SSI risk and that by reducing the OR airborne particulate counts/CFUs at the incision site, the SSI rate was significantly reduced. (Darouiche).

For all these reasons, it is my expert opinion that equipment that blows hot air should not be permitted into ultra-clean surgical environments like those encountered in PJA surgeries because these devices significantly increase particulates and bacterial CFUs in the OR and thereby create an increased risk of infection for these patients. Furthermore, based on the report of Dr. Said Elghobashi's detailed and impressive LES simulation analysis, together with the

published peer-review literature showing that the Bair Hugger FAWs increase particulates in the OR, it is my opinion, to a reasonable degree of medical certainty, that the Bair Hugger FAW more likely than not is a substantial contributing factor in the causation of PJIs.

In summary, having applied the methodological "gold standard" approach which I used in my work for the CDC, I have come to the conclusion that given the characteristics of Bair Hugger FAWs, that they more likely than not to a medical degree of certainty are associated with SSIs in PJA patients. The data to support this conclusion include: 1) particulate levels are correlated with microbial burden (i.e., CFUs) and both are correlated with SSI risk; 2) the Bair Hugger FAWs do not have HEPA filtration and have been found to be internally contaminated with pathogenic organism; 3) studies show that air can circumvent the filtration by passing around the filter; 4) the intake OR air is not sterile; 5) the intake hose, internal FAW device, exhaust or outtake hose have all been shown to commonly be contaminated at >90% levels with common skin organisms; 6) this contaminated air is exhausted in a blanket adjacent to the sterile surgical field; 7) the Bair Hugger FAW blanket has been shown to not be a "secondary filter" and has permitted soot from a burning FAW engine to exhaust soot onto a patient; and 7) the excess or waste heat from the Bair Hugger FAWs is released and causes convection currents under the operating table and thus would bring skin squames and other contaminants from the floor up and into the "sterile" surgical field. The data I have presented demonstrates that the Bair Hugger FAWs, to a reasonable degree of medical certainty, cause or substantially contribute to SSIs in PJA patients. For this reason, it is my opinion that the use of such devices should be abandoned or used only in low risk surgeries not involving implant patients.

I reserve the right to amend the opinions in this report, if further information becomes available to me.

William R. Jarvis, M.D.
President
Jason and Jarvis Associates, LLC
135 Dune Lane
Hilton Head Island, South Carolina 29928

References

Achermann Y, Rössle M, Hoffmann M, Deggim V, Kuster S, Zimmermann DR, Bloemberg G, Hombach M, Hasse B. Prosthetic valve endocarditis and bloodstream infection due to *Mycobacterium chimaera*. J Clin Microbiol. 2013;51:1769-73.

Albrecht M, Gauthier R, and Leaper D. Forced-air warming: a source of airborne contamination in the operating room. Orthopedic Reviews 2009;1:85-89.

Albrecht M, Gauthier RL, Belani K, Litchy M, and Leaper D. Forced-air warming blowers: An evaluation of filtration adequacy and airborne contamination emissions in the operating room. Am J infect Control 2011;39:321-328.

Andersson AE, Bergh I, Karlsson J, Eriksson BI, and Nilsson K. Traffic flow in the operating room: an explorative and descriptive study on air quality during orthopedic trauma implant surgery. Am J Infect Control 2012;40:750-755.

Archibald LK and Jarvis WR. Healthcare-associated infection outbreak investigations by the Centers for Disease Control and Prevention, 1946-2005. Am J Epidemiol 2011;174 (11 Suppl):S47-64.

Avidan MS, Jones N, Ing R, Khoosal M, Lundgren C, and Morrell DE. Convection warmers--not just hot air. Anesth 1997;52:1073-1076.

Barnes S, Salemi C, Fithian D, Akiyama L, Barron D, Eck E, and Hoare K. An enhanced benchmark for prosthetic joint replacement infection rates. Am J Infect Control. 2006;34:669-72.

Barone JE, Tucker JB, Cecere J, Yoon MY, Reinhard E, Blabey RG Jr, Lowenfels AB. Hypothermia does not result in more complications after colon surgery. Am Surg. 1999;65:356-9.

Baucom RB, Phillips SE, Ehrenfeld JM, Muldoon RL, Poulose BK, Herline AJ, Wise PE, Geiger TM. Association of Perioperative Hypothermia During Colectomy With Surgical Site Infection. JAMA Surg. 2015;150:570-5.

Belani KG, Albrecht M, McGovern PD, Reed M, and Nachtsheim C. Patient warming excess heat: The effects on orthopedic operating room ventilation performance. Anesth Analg 2013;117:406-411.

Bernards AT, Harinck IJ, Dijkshoorn L, van der Reijden TJK, and van den Brock PJ. Persistent *Acinetobacter baumannii*? Look inside your medical equipment. Infect Control and Hosp Epidemiol 2004;25:1002-1004.

Berrios-Torres SI, Umschied CA, Bratzler DW, Leas B, Stone EC, Kelz RR, Reinke C, Morgan S, Solomkin JS, Mazuski JE, Dellinger EP, Itani K, Berbari EF, Segreti J, Parvizi J, Blanchard J, Allen G, Kluytmans JAJW, Donlan R, Schecter WP and the Healthcare Infection Control Practices Advisory Committee. Draft CDC Guideline for the Prevention of Surgical Site Infection. http://www.jscva.org/files/CDC-SSI_Guideline_Draft2014.pdf

Brandt S, Oguz R, Huttner H, Waglechner F, Chiari FA, Greif R, Kurz A, and Kimberger O. Resistive-Polymer Versus Forced-Air Warming: Comparable Efficacy in Orthopedic Patients. Anesth Analg 2010;110:834-838.

Brown MJ, Curry TB, Hyder JA, Berbari EF, Truty MJ, Schroeder DR, Hanson AC, Kor DJ. Intraoperative hypothermia and surgical site infections in patients with Class I/Clean wounds: A case-control study. J Am Coll Surg. 2017;224:160-171.

CDC-A, HICPAC Meeting, November 2015 minutes: https://www.cdc.gov/hicpac/pdf/mm/November%205-6%202015HICPAC-Meeting_Summary_Final-508.pdf

CDC-B, HICPAC Meeting, March 31, 2016: https://www.cdc.gov/hicpac/pdf/mm/March-31-2016-HICPAC-Meeting-Summary-FINAL.pdf

CDC-C, HICPAC Meeting, July 14-15, 2016 minutes: https://www.cdc.gov/hicpac/pdf/mm/July-14-15-2016-HICPAC-Summary-FINAL.pdf

Chand M, Lamagni T, Kranzer K, Hedge J, Moore G, Parks S, Collins S, Del Ojo Elias C, Ahmed N, Brown T, Smith EG, Hoffman P, Kirwan P, Mason B, Smith-Palmer A, Veal P, Lalor MK, Bennett A, Walker J, Yeap A, Isidro Carrion Martin A, Dolan G, Bhatt S, Skingsley A, Charlett A, Pearce D, Russell K, Kendall S, Klein AA, Robins S, Schelenz S, Newsholme W, Thomas S, Collyns T, Davies E, McMenamin J, Doherty L, Peto TE, Crook D, Zambon M, Phin N. Insidious risk of severe Mycobacterium infection in cardiac surgery patients. Clin Infect Dis. 2017;64:335-342. UK: 18 patients 2007-2015, range 3m to 5 yrs.

Constantine RS, Kenkel M, Hein RE, Cortez R, Anigian K, Davis KE, Kenkel JM. The impact of perioperative hypothermia on plastic surgery outcomes: a multivariate logistic regression of 1062 cases. Aesthet Surg J. 2015;35:81-8.

Cram P, Lu X, Kates Sl, Li Y, and Wolf BR. Total knee arthroplasty volume, utilization, and outcomes among medicare beneficiaries, 1991-2010. JAMA 2012;308:1227-1236.

Darouiche RO, Green DM, Harrington MA, Ehni BI, Kougias P, Bechara CF, and O'conner DP. Association of airborne microorganisms in the operating room with implant infections: A Randomized Controlled Trial. Infect Control Hosp Epidemiol 2017;38:3-10.

Dasari KB, Albrecht M, and Harper M. Effect of forced-air warming on the performance of operating theatre laminar flow ventilation. Anesthesia 2012;67:244-249.

Edmiston CE JR, Sinski S, Seabrook GR, Simons D, and Goheen MP. Airborne particles in the OR environment. AORN J 1999;69:1169-1172.

Edmiston CE Jr, Seabrook GR, Cambria RA, Brown KR, Lewis BD, Sommers JR, Krepel CJ, Wilson PJ, Sinski S, and Towne JB. Molecular epidemiology of microbial contamination in the operating room environment: Is there a risk for infection? Surgery. 2005;138:573-579.

Foster WD and Hutt MS. Experimental staphylococcal infections in man. Lancet. 1960;2:1373-6.

Frisch NB, Pepper AM, Rooney E, Silverton C. Intraoperative hypothermia in total hip and knee arthroplasty. Orthopedics. 2016 Oct 25:1-8.

Garner JS, Jarvis WR, Emori TG, Horan TC, and Hughes JM. CDC definitions for nosocomial infections, 1988. Am J Infect Control 1988;16:128-40.

Gosden PE, MacGowan AP, Bannister GC. Importance of air quality and related factors in the prevention of infection in orthopaedic implant surgery. J Hosp Infect. 1998;39:173-80.

Haller S, Höller C, Jacobshagen A, Hamouda O, Abu Sin M, Monnet DL, Plachouras D, Eckmanns T. Containation during production of heater-cooler units by *Mycobacterium chimaera* potential cause for invasive cardiovascular infections: results of an outbreak investigation in Germany, April 2015 to February 2016. Euro Surveill. 2016;21(17).

Hambraeus A and Laurell G. Protection of the patient in the operating suite. J Hosp Infect. 1980;1:15-30.

Hidron AI, et.al., NHSN annual update: antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006-2007. Infect Control Hosp Epidemiol 2008;29:996-1011.

Hidron AI et.al., NHSN annual update: antimicrobial-resistant pathogens associated with healthcare-associated infections: annual summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2006-2007. Erratum. Infect Control Hosp Epidemiol 2009;30:107.

Horan TC, Gaynes RP, Martone WJ, Jarvis WR, and Emori TG. CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. Infect Control Hosp Epidemiol 1992;13:606-608.

Huang JKC, Shah SF, Vinodkuman N, Hegarty MA, and Greatorex RA. The bair hugger patient warming system in prolonged vascular surgery: an infection risk? Crit Care 2003;7:R13-R16.

Jaekel DJ, Ong KL, Lau EC, Watson HN, and Kurtz SM. Epidemiology of total hip and knee arthroplasty infection. B.D Springer and J Parvizi (eds). Periprosthetic Joint Infection of the Hip and Knee. New York 2014. Chapter 1.

Jarvis WR. Benchmarking for prevention: the Centers for Disease Control and Prevention's National Nosocomial Infections Surveillance (NNIS) system experience. Infection 2003;31 Suppl 2:44-48.

Kawaraguchi Y, Kawaguchi M, Inoue S, Sakamoto T, Kitaguchi K, Furuya H, Sakaki T. Effect of deliberate mild hypothermia on the incidence of surgical-wound infection and duration of hospitalization in neurosurgical patients. Masui. 1999;48:232-7.

Kohler P, Kuster SP, Bloemberg G, Schulthess B, Frank M, Tanner FC, Rössle M, Böni C, Falk V, Wilhelm MJ, Sommerstein R, Achermann Y, Ten Oever J, Debast SB, Wolfhagen MJ, Brandon Bravo Bruinsma GJ, Vos MC, Bogers A, Serr A, Beyersdorf F, Sax H, Böttger EC, Weber R, van Ingen J, Wagner D, Hasse B. Healthcare-associated prosthetic heart valve, aortic vascular graft, and disseminated *Mycobacterium chimaera* infections subsequent to open heart surgery. Eur Heart J. 2015;36:2745-53.

Kurz A, Sessler DI, and Lenhardt R for the Study of Wound Infection and Temperature Group. Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. NEJM 1996;334:1209-1215.

Kurtz SM, Lau E, Watson H, Schmier JK, and Parvizi J. Economic burden of periprosthetic joint infection in the United States. The J of Arthroplasty 2012;8 Suppl; 61-65.

Lehtinen SJ, Onicescu G, Kuhn KM, Cole DJ, Esnaola NF. Normothermia to prevent surgical site infections after gastrointestinal surgery: holy grail or false idol? Ann Surg. 2010;252:696-704.

Legg AJ, Cannon T, and Hamer AJ. Do forced air patient-warming devices disrupt unidirectional downward airflow? The J Bone and Joint Surgery 2012;2:254-256.

Legg AJ and Hamer AJ. Forced-air patient warming blankets disrupt unidirectional airflow. The J Bone and Joint Surgery 2013;95-B:407-410.

Lidwell OM, Richards ID, Polakoff S. Comparison of three ventilating systems in an operating room. J Hyg (Lond). 1967;65:193-205.

Lidwell OM, Lowbury EJ, Whyte W, Blowers R, Stanley SJ, and Lowe D. Airborne contamination of wounds in joint replacement operations: the relationship to sepsis rates. J Hosp Infect. 1983;4:111-31.

Lidwell OM, Elson RA, Lowbury EJ, Whyte W, Blowers R, Stanley SJ, and Lowe D. Ultraclean air and antibiotics for prevention of postoperative infection. A multicenter study of 8,052 joint replacement operations. Acta Orthop Scand. 1987;58:4-13.

Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Prevention of Surgical Site Infection, 1999. Am J Infect Control 1999;27:97-132.

McGovern PD, Albrecht M, Belani KG, Nachtsheim, Partington PF, Carluke I, and Reed MR. Forced-air warming and ultra-clean ventilation do not mix. The J Bone and Joint Surgery 2011;93-B:1537-1544.

Melton GB, Vogel JD, Swenson BR, Remzi FH, Rothenberger DA, Wick EC. Continuous intraoperative temperature measurement and surgical site infection risk: analysis of anesthesia information system data in 1008 colorectal procedures. Ann Surg. 2013;258:606-12.

Moretti B, Larocca AMV, Napoli C, Martinelli D, Paolillo L, Cassano M, Notarnicola A, Moretti L and Pesce V. Active warming systems to maintain perioperative normothermia in hip replacement surgery: a therapeutic aid or a vector of infection? J Hosp Infect 2009;73:58-63.

Perkins KM, Lawsin A, Hasan NA, Strong M, Halpin AL, Rodger RR, Moulton-Meissner H, Crist MB, Schwartz S, Marders J, Daley CL, Salfinger M, Perz JF. Notes from the field: *Mycobacterium chimaera* contamination of heater-cooler devices used in cardiac surgery. MMWR Morb Mortal Wkly Rep. 2016;65:1117-1118.

Reed M, Kimberger O, McGovern PD, and Albrecht MC. Forced-air warming design: Evaluation of intake filtration, internal microbial buildup, and airborne-contamination emissions. Am Assoc Nurs Anesth J 2013;81:275-280.

Robinson JO, Coombs GW, Speers DJ, Keehner T, Keil AD, D'Abrera V, Boan P, Pang S. *Mycobacterium chimaera* colonization of heater-cooler units (HCU) in Western Australia 2015: investigation of possible iatrogenic infection using whole genome sequencing. Euro Surveill. 2016;21:30396.

Sax H, Bloemberg G, Hasse B, Sommerstein R, Kohler P, Achermann Y, Rössle M, Falk V, Kuster SP, Böttger EC, Weber R. Prolonged outbreak of *Mycobacterium chimaera* infection after open-chest heart surgery. Clin Infect Dis. 2015;61:67-75.

Sessler DI, Olmsted RN, and Kuelpmann R. Forced-air warming does not worsen air quality in laminar flow operating rooms. Anesth Analg 2011;113:1416-1421.

Sessler DI, Olmsted Rn, and Kuelpmann R. Forced-air warming does not worsen air quality in laminar flow operating rooms. Anesth Analg 2011;113:1416-1421.

Soetaert K, Vluggen C, André E, Vanhoof R, Vanfleteren B, Mathys V. Frequency of *Mycobacterium chimaera* among Belgian patients, 2015. J Med Microbiol. 2016;65:1307-1310.

Sommerstein R, Rüegg C, Kohler P, Bloemberg G, Kuster SP, Sax H. Transmission of *Mycobacterium chimaera* from heater-cooler units during cardiac surgery despite an ultraclean air ventilation system. Emerg Infect Dis. 2016;22:1008-13.

Stocks GW, Self SD, Thompson B, Adame XA, O'Conner DP. Predicting bacterial populations on airborne particles: a study performed in non-laminar flow operating rooms during joint arthroplasty surgery, Am J Infect Control 2010;38:199-204.

Sun Z, Honar H, Sessler DI, Dalton JE, Yang D, Panjasawatwong K, Deroee AF, Salmasi V, Saager L, and Kurz A. Intraoperative core temperature patterns, transfusion requirement, and hospital duration in patients warmed with forced air. Anesth 2015;122:276-285.

Suzuki A, Namba Y, Matsuura M and Horisawa A. Airborne contamination in an operating suite:report of a five-year survey. J Hyg Camb 1984;93:567-573.

Trudzinski FC, Schlotthauer U, Kamp A, Hennemann K, Muellenbach RM, Reischl U, Gärtner B, Wilkens H, Bals R, Herrmann M, Lepper PM, Becker SL. Clinical implications of *Mycobacterium chimaera* detection in thermoregulatory devices used for extracorporeal membrane oxygenation (ECMO), Germany, 2015-2016. Euro Surveill. 2016;21:30398.

Tsai J.Y., Moon T., Vachhani S., Van Meter A., Dang A.Q., Potylchansky E. Forced air warming device failure resulting in smoke and soot on a surgical patient. Abstract No. 14AP04-7. The European Anaesthesiology Congress, London, England, May 28-30, 2016.

Whyte W, Vesley D, and Hodgson R. Bacterial dispersion in relation to operating room clothing. J Hyg Camb 1976;76:367-378.

Whyte W. The role of clothing and drapes in the operating room. J Hosp Infect 1988;11 (Suppl C):2-17.

Wong PF, Kumar S, Bohra A, Whetter D, Leaper DJ. Randomized clinical trial of perioperative systemic warming in major elective abdominal surgery. Br J Surg. 2007;94:421-6.

Wood AM, Moss C, Keenan A, Reed MR, and Leaper DJ. Infection control hazards associated with the use of forced-are warming in operating theatres. J Hosp Infect 2014;88:132-140.

Zink RS and Iaizzo PA. Convective warming therapy does not increase the risk of wound contamination in the operating room. Anesth Anlag 1993;76:50-53.

Attachment B
Cases Testified as Expert at Trial or Deposition by William R. Jarvis, M.D.
(March 2013-March 2017)

Winston & Strawn LLP, Chicago, Illinois (SE Missouri Hospital and St. Francis Medical Center, on behalf of themselves and all others similarly situated v. C.R. Bard, Inc.). Deposition given.

Mr. Stephen M. Masters, Joliet, Illinois (Ronald Fuqua vs. Central Du Page Hospital Association). Deposition given.

Mrs. A. Candace Marcus, McIntosh Sawran Peltz & Cartaya, P.A., Fort Lauderdale, Florida (Bowman v. CCF Naples, et al.). Deposition given.

Mrs. Andrea Kott, Chicago, Illinois (Radak v. Evanston Northwestern Healthcare Corporation, et al.). Deposition given.

Mr. Mark Levine, Bartlit Beck Herman Palenchar & Scott LLP, Chicago, Illinois (ICU Medical, Inc. v. RyMed Technologies, Inc.). Deposition given.

Mr. Steven J Klearman, Reno, Nevada (Nolan v. South Lyon Health Center, et al.). Deposition given.

Mr. Thomas Saieva, Esq., Saieva & Stine, P.A., Tampa, Florida (Adolphson v Memorial Hospital of Tampa). Deposition given.

Mr. J. Dan Smith, McDonnell Boehnen Hulbert & Berghoff LLP, Chicago, Illinois (Ivera Medical Corporation v. Hospira, Inc.). Deposition given.

Mr. Ed Ciarimboli, Fellerman Ciarimboli Law, PC, Kingston, Pennsylvania (Una Valanski vs Hampton House, Hampton House Wilkes-Barre PA, LLC, HCR Manorcare, Leonard Kuchemba, M.D., Intermountain Medical Group). Trial testimony given.

Mrs. Carly S. Levin, Esq., Venable LLP, Washington, DC (Ivera Medical Corporation and Becton Dickinson and Company vs. Hospira, Inc. and Catheter Connections, Inc.). Deposition given.

Janet, Jenner & Suggs, LLC, Columbia, South Carolina (Frank Heaps, III v. Lexington County Health Services). Deposition given.

Mr. Ciarimboli, Fellerman Ciarimboli Law, PC, Kingston, Pennsylvania (Una Valanski vs Hampton House, Hampton House Wilkes-Barre PA, LLC, HCR Manorcare, Leonard Kuchemba, M.D., Intermountain Medical Group). Trial testimony given.

Mr. H. William McIntosh, The McIntosh Law Firm, PC, Kansas City, MO (Thurmond, et al. v. Kloster, et al.). Deposition given.

Mr. Ed Ciarimboli, Fellerman Ciarimboli Law, PC, Kingston, Pennsylvania (Janice Yalch vs. Alex Huang, M.D., J.T. Juang, M.D., P.C., Jung T. Huang, M.D., Geisinger South Wilkes-Barre Health System, Geisinger Clinic). Trial testimony given.

Mr. William W. Bird, The Bird Law Firm, P.C., St. Joseph, Missouri (James K. Sullwold, et al. v. Heartland Regional Medical Center a/k/a Mosiac Life Care, Inc.). Deposition and trial testimony given.

Mr. Theodore Walton, Clay Daniel Walton & Adams PLC, Louisville, Kentucky (Angie G. Huletter, Waller Hulette, Audrey Hulette, Emily Hulette and Andrew Hulette vs. GZA Geoenvironmental, Inc., et al.). Deposition given.

Mr. Jason C. Molesso, Sanders Viener Grossman, Mineola, New York (Loraine Angueira v. NYU Hospitals Center d/b/a NYU Hospital for Joint Diseases. Trial testimony given.

Attachment C
HEALTHCARE EPIDEMIOLOGY
2016 FEE SCHEDULE

William R. Jarvis, M.D.
Jason and Jarvis Associates, LLC
135 Dune Lane
Hilton Head Island, SC 29928
(Tel: 843-686-3750)

42338 Parkwood Drive
Port Orford, OR 97465
(Tel: 541-332-3750)

E-mail: WRJMJ@AOL.COM

Reviewing medical records, surveillance data, or other infection control records or policies	----------	$700/hour
Preparing written reports	----------	$700/hour
Conference calls/telephone consultation (including verbal reports):	----------	$700/hour
Depositions (minimum fee: $4,000)	----------	$800/hour
Trial testimony (minimum fee: $4,500)	----------	$900/hour

*When travel is required, lodging, transportation (air, train, cab, subway, miles driven, etc.), food, other expenses, and a per diem of $250 per hour for the duration of travel also will be charged.

Attachment A

CURRICULUM VITAE

William Robert Jarvis, M.D.
Jason and Jarvis Associates, LLC

E-mail Address: WRJMJ@aol.com

Place of Birth: Oakland, California

Citizenship: USA

Education:

1966-1970	University of California Davis, California Degree: B.S. Psychology
1970-1971	University of California Davis, California Graduate work in Physiology
1971-1974	University of Texas Health Science Center School of Medicine Houston, Texas Degree: M.D.
1974-1975	University of Texas Health Science Center Houston, Texas Internship: Straight Pediatrics (PL1)
1975-1977	Children's Hospital of Los Angeles University of Southern California

Los Angeles, California
Residency: Pediatrics (PL2, PL3)

1977-1978 Hospital for Sick Children
University of Toronto
Toronto, Ontario, Canada
Division of Infectious Diseases
Teaching Fellow in Pediatric Infectious Disease

1978-1980 Yale University School of Medicine
New Haven, Connecticut
Department of Pediatrics, Epidemiology, and Public Health
Postdoctoral Fellow in Infectious Diseases (Virology and Epidemiology)

1980-1982 Epidemic Intelligence Service (EIS) Officer
Hospital Infections Branch
Center for Disease Control
Atlanta, Georgia

1981-1983 Preventive Medicine Resident
Centers for Disease Control
Atlanta, Georgia

Appointments:

1981-1984 Medical Epidemiologist
Surveillance and Prevention Branch
Hospital Infections Program
Center for Infectious Diseases
Centers for Disease Control
Atlanta, Georgia

1981-1989 Assistant Chief
National Nosocomial Infections Surveillance (NNIS) System
Hospital Infections Program
Center for Infectious Diseases
Centers for Disease Control
Atlanta, Georgia

1984-1987 Assistant Chief
Epidemiologic Investigations Branch

Hospital Infections Program
Center for Infectious Diseases
Centers for Disease Control
Atlanta, Georgia

1985-1995 Clinical Assistant Professor
Division of Pediatric Infectious Diseases and Immunology
Department of Pediatrics
Emory University School of Medicine
Atlanta, Georgia

1987-1989 Acting Chief
Epidemiology Branch
Hospital Infections Program
Center for Infectious Diseases
Centers for Disease Control
Atlanta, Georgia

1989-1991 Chief
Epidemiology Branch
Hospital Infections Program
Center for Infectious Diseases
Centers for Disease Control
Atlanta, Georgia

1991-2000 Chief
Investigation and Prevention Branch
Hospital Infections Program
National Center for Infectious Diseases
Centers for Disease Control
Atlanta, Georgia

1992-2005 Adjunct Assistant Professor
Rollins School of Public Health
Emory University
Atlanta, Georgia

1989-1990 Chair-elect
Division L (Nosocomial Infections)
American Society for Microbiology

1990-1991 Chairman
Division L (Nosocomial Infections)
American Society for Microbiology

1996-2005	Clinical Associate Professor Division Pediatric Infectious Diseases, Immunology and Epidemiology Department of Pediatrics Emory University School of Medicine Atlanta, Georgia
1996-1998	Acting Director Hospital Infections Program National Center for Infectious Diseases Centers for Disease Control and Prevention Atlanta, Georgia
1999-2000	Vice-President, The Society for Healthcare Epidemiology of America
2000-2001	President-elect, The Society for Healthcare Epidemiology of America
2000-2001	Senior Editor, icanPrevent, ican, Inc.
2001-2002	President, The Society for Healthcare Epidemiology of America
2001-2002	Associate Director for Program Development Division of Healthcare Quality Promotion (Formerly the Hospital Infections Program) National Center for Infectious Diseases Centers for Disease Control and Prevention Atlanta, Georgia
2002-2003	Past-President, The Society for Healthcare Epidemiology of America
2000-2003	Member, Research Foundation for Prevention of Complications Associated with Health Care, Association for Professionals in Infection Control and Epidemiology, Inc.
2003-2005	Chairman, Research Foundation for Prevention of Complications Associated with Health Care, Association for Professionals in Infection Control and Epidemiology, Inc.
2002-2003	Director, Office of Extramural Research, Office of the Director, National Center for Infectious Diseases,

Centers for Disease Control and Prevention.

2003-current — President, Jason and Jarvis Associates, LLC. Private consultant, healthcare epidemiology, infection control, pediatrics, infectious diseases, epidemiology

2004-2007 — Editor, *Infection Control and Hospital Epidemiology*

2004-2006 — Member, Food and Drug Administration, General Hospital and Personal Use Panel.

2007-current — Chairman, Food and Drug Administration (FDA), General Hospital and Personal Use Panel.

Awards:

Graduated with honors, University of California, Davis, California, 1970

Sparks's Memorial Award for Academic Excellence University of California, Davis, 1969 and 1970

Commendation Award, (Epidemic Investigations), United States Public Health Service, 1988

Unit Commendation, (*Yersinia enterocolica* Sepsis Investigation), United States Public Health Service, 1989

Outstanding Service Award, (Epidemic Investigations), United States Public Health Service, 1990

Unit Commendation, (Dialysis Investigation), United States Public Health Service, 1990

Unit Commendation, (Allergic Reactions in Hemodialysis Patients), United States Public Health Service, December 1990

Unit Commendation, (AIDS Healthcare Workers Guideline), United States Public Health Service, December 1990

Unit Commendation, (Nosocomial Transmission of TB in AIDS Patients), United States Public Health Service, December 1990

Outstanding Unit Commendation (Nosocomial Infection Surveillance), United States Public Health Service, April 1991

Unit Commendation, (Combating MDR-TB),
United States Public Health Service, February 1993

Outstanding Unit Commendation, (Latex Allergy Studies),
United States Public Health Service, June 1993

CDC Equal Opportunity Achievement Award, 1993

Public Health Service Excellence Award, 1993

Charles C. Shepard Science Award (Outstanding Scientific Paper Published at CDC), An Outbreak of Multidrug-Resistant Tuberculosis Among Hospitalized Patients with the Acquired Immunodeficiency Syndrome: Epidemiologic Studies and Restriction Fragment Length Polymorphism Analysis, June 1993

Unit Commendation (Fluoride Toxicity in Dialysis),
United States Public Health Service, November 1993

Meritorious Service Award (Outstanding

Leadership in Investigation and Control of Outbreaks and Superb Conduct of Epidemiologic Studies),
United States Public Health Service, December 1993

Unit Commendation, (Organizing FDA/CDC Latex Conference),
United States Public Health Service, March 1994

Outstanding Unit Commendation, (MDR-TB Outbreak Follow-up Studies), United States Public Health Service, July 1994

CDC Philip S. Brachman Excellence in Teaching Award, 1995

Unit Commendation, (Timeliness and Effectiveness of Applying New Promotion Precept), United States Public Health Service, October 29, 1996

CDC Equal Opportunity Award, June 1997

CDC Research - Operational Award (For Dedicated and Sustained Excellence in Investigating Outbreaks and Developing or Disseminating Guidelines for Prevention of Nosocomial Infections and Diseases), June 1997

Unit Commendation, (Y2K Preparation and Final Testing Group)
United States Public Health Service, April 1998

CDC/ATSDR Communicator's Roundtable Award
(Outstanding Achievement: Videoconference: Antimicrobial Use and Resistance: Solutions to the Problem), 1998

NCID James H. Nakano Citation for Outstanding Scientific Paper in 1998 (Liver Failure after Exposure to Microcystins at a Hemodialysis Center in Brazil), 1999

Best Poster Award, Deafness and Blindness Following Hemodialysis, Food and Drug Administration, 1999

FDA Group Recognition Award, Hemodialysis Blood Tubing Set Outbreak Investigative Team, May 1999

Outstanding Unit Citation (Blood Action Team),
United States Public Health Service, May 1999

Association of Operating Room Nurses-Kimberly-Clark Award for Outstanding Education of Healthcare Professionals, June 2000

NCID James H. Nakano Citation for Outstanding Scientific Paper in 1999 (The Emergence of Vancomycin-Intermediate Resistant *Staphylococcus aureus* in the United States), January 2000

CDC Donald C. Mackel Memorial Award (*Serratia liquifaciens* Bloodstream Infections and Pyrogenic Reactions Associated with Extrinsic Contamination of Erythropoietin, Colorado), April 2000

Unit Commendation (Home Infusion Therapy Study Team),
United States Public Health Service, June 2000.

DHHS, CDC and ATSDR Group Award for Investigation and Prevention Branch, HIP Activities, June 2000.

Glaxo-Wellcome's Child Health Recognition Award-Individual Recognition Award Honorable Mention, July 2000.

Unit Commendation (Outbreak Investigations),
United States Public Health Service, October 2000.

Unit Commendation (For Development of the International Tuberculosis Guideline for Healthcare Worker Safety), United States Public Health Service, February 2001.

Outstanding Unit Citation (For Investigation of the Microcystin Outbreak in Dialysis Patients in Brazil), United States Public Health Service, March 2001.

Outstanding Unit Citation (For the Nationwide Albuminar Outbreak Investigation), United States Public Health Service, March 2001.

CDC Distinguished Friend of the EIS Award, (For Outstanding Teaching of EIS officers), April 2001.

Unit Commendation (For Bacterial Contamination of Blood Products Study Team), United States Public Health Service, September 2001.

NCID James H. Nakano Citation for Outstanding Scientific Paper in 2000 (Toxic Endothelial Cell Destruction in Ophthalmology Patients Associated with Medical Device Sterilization), May 2001.

NCID James H. Nakano Citation for Outstanding Scientific Paper in 2001 (Control of Vancomycin-resistant Enterococcus in 32 Healthcare Facilities in the Siouxland Region), May 2002.

Charles C. Shepard Award for Outstanding CDC Scientific Publication in 2002 (Prevention for Control of Vancomycin-resistant Enterococcus in 32 Healthcare Facilities in the Siouxland Region), June 2002.

NCID James H. Nakano Citation for Outstanding Scientific Paper for 2002. (*Serratia marcescens* Bloodstream Infections in a Surgical Intensive Care Unit Associate with Narcotic Abuse), February 2003.

Society for Healthcare Epidemiology of America (SHEA) Lectureship Award, April 2003.

Centers for Disease Control and Prevention, Lifetime Scientific Achievement Award, June 2003.

National Center for Infectious Diseases, Centers for Disease Control and Prevention, Joseph E. McDade Citation, June 2003.

Centers for Disease Control and Preventionôs Lifetime Scientific Achievement Award in Epidemiology, March 2010

Board Certification:

Texas State Board of Medical Examiners, May 1974

Diplomate, American Board of Pediatrics, September 1979

Board eligible, Pediatric Infectious Diseases

Board eligible, Preventive Medicine

State Medical Licensure:

Texas

California

Georgia

Society/Organization Membership:

Infectious Diseases Society of America

Society For Healthcare Epidemiology of America

Association For Professions in Infection Control and Epidemiology,

American Academy of Pediatrics (Fellow)

Committees/Boards:

Epidemic Intelligence Service Conference
Scientific Program Committee, 1985
Society of Hospital Epidemiology of America
Severity of Illness Committee, 19851987
First International Conference on the Prevention of Infection,
Executive and Scientific Committees, 19871990
Third International Conference on Nosocomial Infections,
Scientific Program Committee, 1989-1990
Joint Committee on Accreditation of Healthcare Organizations,
Infection Control Indicator Development Task Force, 19891993
United States Public Health Service Medical Quality Review Board
(CDC representative), 1989-1994

Biosafety Committee, Hospital Infections Program, Center for Infectious Diseases, CDC, 19891995
Society of Hospital Epidemiologist of America, Nominating Committee, 1990
American Society for Microbiology, Division L (Nosocomial Infections), Chairman, Nominating Committee, 1990
Society of Hospital Epidemiologists of America Education Committee, 19891990, 1996-2000
American Society for Microbiology, Foundation of Microbiology, Invited Lecturer, 1990-1991 and 1998-2000

Second International Conference on the Prevention of Infection, International Scientific Committee, 1991-1992
Third International Conference on the Prevention of Infection, International Scientific Committee, 1992-1993
Society For Healthcare Epidemiology of America, Long Term Planning Committee, 1994-1998
Fourth International Conference on the Prevention of Infection, International Scientific Committee, 1994
American Hospital Association, Advisory Committee for Disease Prevention and Health Care Epidemiology, 1996-2004
Board of Directors, The Society for Healthcare Epidemiology of America, 1999-2003
4th Decennial International Conference on Nosocomial, Program and Scientific Committees, 1998-2000
Fifth International Conference on the Prevention of Infection (renamed Research and Prevention Conference), International Scientific Committee, 1998-2000
Society For Healthcare Epidemiology of America, Bioterrorism Task Force, 1999-
Society For Healthcare Epidemiology of America, Nominating Committee, 2000
Department of Veterans Affairs, Epidemiologic Studies Merit Review Committee, 1999-2003
Society For Healthcare Epidemiology of America, Annual Meeting Planning Committee, 2002-
National Foundation for Infectious Disease Grant Review Committee, 1998-
Society For Healthcare Epidemiology of America, Ortho-McNeil Antibiotic Management Fellowship Review Committee, 2002-2004
Society For Healthcare Epidemiology of America, Glaxco-Smith-Kline, Surgical Infections Fellowship Review Committee, 2002-2004
Association for Professionals in Infection Control and

Epidemiology Research Foundation, Trustee, 2000-2003
Association for Professionals in Infection Control and Epidemiology Research Foundation, Board of Directors, Vice-President, 2004-2005

Association for Professionals in Infection Control and Epidemiology Research Foundation, Board of Directors, President, 2005-2006
Association for Professionals in Infection Control and Epidemiology Research Foundation, Board of Directors, Past-President, 2006-2007

National Symposia Organized and Moderated: (>150; available upon request).

Publications

1. William R. Jarvis, Peter J. Middleton, and Erwin W. Gelfand. Parainfluenza Pneumonia in Severe Combined Immunodeficiency. Journal of Pediatrics 1979;94:423-425.

2. William R. Jarvis. Measles Meningoencephalitis: An Unusual Presentation. American Journal of Diseases of Children 1979;133:751-752.

3. William R. Jarvis. A Study of Beta Hemolytic Streptococcal Pharyngitis in Patients with Infectious Mononucleosis. Clinical Pediatrics 1980;19:463-467.

4. William R. Jarvis, Robert Sutton, and W. Douglas Biggar. Listeria Meningitis in a Normal Child. Clinical Pediatrics 1980;19:708-709.

5. William R. Jarvis, Stanley Banko, Evan Synder, and Robert S. Baltimore. *Pasteurella multocida* Osteomyelitis Following Dog Bites. American Journal of Diseases of Children 1981;135:625-628.

6. William R. Jarvis, David Luce, and Robert S. Baltimore. *Arizona hinshawii* Meningitis in a Neonate. Clinical Pediatrics 1981;20:483-484.

7. William R. Jarvis and Grace Tucker. Aseptic Meningitis Associated with Echovirus Type 7 in Very Young Children. American Journal of Diseases of Children 1981;135:1009-1012.

8. William R. Jarvis. Precautions For Creutzfeldt Jakob Disease. Infection Control 1982;3:238-239.

9. William R. Jarvis. Recommended Precautions For Patients with Legionnaire's Disease. Infection Control 1982;3:401-402.

10. William R. Jarvis, Janet L. Mosser, James R. Allen, James M. Hughes, and Robert W. Haley. Changing Practices in the Use of Benzyl AlcoholPreserved Solutions in Neonatal Intensive Care Units. American Journal of Diseases of Children 1983;137:505.

11. William R. Jarvis, Micheal Towns, Otto NunezMontiel, J. Glenn Morris, Francis S. Thompson, Edward O. Hill, and Vulvus R. Dowell. Comparison of Bacterial Isolation, Cytotoxicity Assay and Counterimmunoelectrophoresis for the Detection of *Clostridium difficile* or it's toxin. Journal of Infectious Diseases 1983;147:778.

12. William R. Jarvis, Peter J. Middleton, and Erwin W. Gelfand. The Significance of Viral Infections in Severe Combined Immunodeficiency. Pediatric Infectious Diseases Journal 1983;2:187-193.

13. William R. Jarvis, Anita K. Highsmith, James R. Allen, and Robert W. Haley. Polymicrobial Bacteremia in a Neonatal Intensive Care Unit. Pediatric Infectious Diseases Journal 1983;2:203-209.

14. William R. Jarvis, David Smith, and R. Keith Sikes. Changing Practices in the Use of Benzyl AlcoholPreserved Solutions in Neonatal Intensive Care Units in Georgia. Journal of the Medical Association of Georgia 1983;72:707-708.

15. William R. Jarvis, Micheal Towns, Otto NunezMontiel, J. Glenn Morris, Francis S. Thompson, W. Ralph Vogler, Elliott F. Winton, Edward O. Hill, and Vulvus R. Dowell. FalsePositive *Clostridium difficile* Counterimmunoelectrophoresis Tests: The Role of *Clostridium bifermentans* and *Clostridium sordellii*. Journal of Infectious Diseases 1983;148:1168-1169.

16. Rima F Khabbaz, Paul M. Arnow, Anita K. Highsmith, Loreen A. Herwaldt, Teresa Chou, William R. Jarvis, Nicholas W. Lerche, and James R. Allen. *Pseudomonas fluorescens* Bacteremia from Blood Transfusion. American Journal of Medicine 1984:;76:62-68.

17. William R. Jarvis and Anita K. Highsmith. Bacterial Growth and Endotoxin Production in Lipid Emulsion. Journal of Clinical Microbiology 1984;19:172-0.

18. J. Glenn Morris, William R. Jarvis, Otto L. NunezMontiel, Micheal Towns, Francis S. Thompson, Vulvus R. Dowell, Edward O. Hill, W. Ralph Vogler, Elliott F. Winton, and James M. Hughes. *Clostridium difficile*: Colonization and Toxin Production in a Cohort of Patients with Malignant Hematologic Disorders. Archives of Internal

Medicine 1984;144:967969.

19. William R. Jarvis, Van P. Munn, Anita K. Highsmith, David Culver, and James M. Hughes, M.D. The Epidemiology of Nosocomial Klebsiella Infections. Infection Control 1985;6:68-75.

20. Anita K. Highsmith and William R. Jarvis. *Klebsiella pneumoniae*: Selected Virulence Factors That Determine Pathogenicity. Infection Control 1985;6:75-78.

21. Ofelia C. Tablan, Terence C. Chorba, Daniel V. Schidlow, John W. White, Karen A. Hardy, Peter H. Gilligan, W. Mead Morgan, Loretta A. Carson, William J. Martone, Janine M. Jason, and William R. Jarvis. *Pseudomonas cepacia* Colonization of Patients with Cystic Fibrosis: Risk Factors and Clinical Outcome. Journal of Pediatrics 1985;107:382-387.

22. William R. Jarvis, Clyde Thornsberry, John Boyce, and James M. Hughes. Methicillin-resistant *Staphylococcus aureus* in Children's Hospitals in the United States. Pediatric Infectious Diseases Journal 1985;4:651-656.

23. Weems JJ Jr, Jarvis WR, and Colman G. A Cluster of Late Onset Group B Streptococcal Infections in Low Birth Weight Premature Infants: No Evidence for Horizontal Transmission. Pediatric Infectious Disease Journal 1986;5:715-717.

24. Jarvis WR. Nosocomial Infections in Pediatric Patients. Pediatric Infectious Disease Journal 1987;6:344-351.

25. Tablan OC, Carson LA, Cusick LB, Bland LA, Martone WJ, and Jarvis WR. Laboratory Proficiency Test Results on Use of Selective Media for Isolating *Pseudomonas cepacia* from Simulated Sputum Specimens of Patients with Cystic Fibrosis. Journal of Clinical Microbiology 1987:25;485-487.

26. Tablan OC, Martone WJ, Doershuk CF, Stern RC, Thomassen MJ, Klinger JD, White JW, Carson LA, and Jarvis WR. Colonization of the Respiratory Tract with *Pseudomonas cepacia* of Patients with Cystic Fibrosis: Risk Factors and Outcomes. Chest 1987;91:527-533.

27. Safranek TJ, Jarvis WR, Carson LA, Cusick LB, Bland LA, Swenson JM, and Silcox V. *Mycobacteria chelonae* Wound Infections After Plastic Surgery Employing Contaminated Gentian Violet Skin Marking Solution. New England Journal of Medicine 1987;317:197-201.

28. Jason JM and Jarvis WR. Infectious Diseases: Preventable Causes of Infant Mortality.
Pediatrics 1987;80:335-341.

29. Jarvis WR, Tablan OC, Martone WJ, Olson DR, and Hughes JM. The Epidemiology

of Nosocomial *Pseudomonas cepacia* Infections: Endemic Infections. European Journal of Epidemiology 1987;3:233-237.

30. Martone WJ, Tablan OC, and Jarvis WR. The Epidemiology of Nosocomial Epidemic *Pseudomonas cepacia* Infections. European Journal of Epidemiology 1987;3:222-233.

31. Tablan OC, Martone WJ, and Jarvis WR. The Epidemiology of *Pseudomonas cepacia* in Patients with Cystic Fibrosis. European Journal of Epidemiology 1987;3:336-342.

32. Rabkin C, Martone WJ, and Jarvis WR. Current Status of *Pseudomonas cepacia* Typing Systems. European Journal of Epidemiology 1987;3:343-346.

33. Garner J, Jarvis WR, Emori G, Horan TC, and Hughes JM. The Centers for Disease Control Definitions for Nosocomial Infections, 1988. American Journal of Infection Control 1988;16:128-140.

34. Gross PA, Byet EE, Decker MD, Garibaldi RA, Heirholzer WJ, Jarvis WR, Larson E, Simmons BJ, Schekler WE, and Harkavy L. Description of Case-mix Adjusters by Severity of Illness Working Group. Hospital Epidemiology and Infection Control 1988;9:309-317.

35. Lowry PW, Jarvis WR, Oberle A, Bland LA, Silberman R, Bocchini JA, Dean H, Swenson JM, and Wallace RJ. *Mycobacterium chelonae* Causing Otitis Media in an Ear, Eye, and Nose Practice. New England Journal of Medicine 1988:319;978-983.

36. Gordon SM, Tipple M, Bland LA, and Jarvis WR. Pyrogenic Reactions Associated with the Use of Processed Disposable Hollow Fiber Hemodialyzers. Journal of the American Medical Association 1988;260:2077-2081.

37. Carson LA, Tablan OC, Cusick LB, Jarvis WR, Favero FS, and Bland LA. Comparative Evaluation of Selective Media for Isolation of *Pseudomonas cepacia* from Cystic Fibrosis patients and Environmental Sources. Journal of Clinical Microbiology 1988;26:2096-2100.

38. Hebert GA, Crowder CG, Hancock GA, Jarvis WR, and Thornsberry C. Biochemical Characteristics of Coagulasenegative Staphylococci: Simple Tests that Help

Differentiate These Species and Other Micrococcaceae. Journal of Clinical Microbiology 1988;26:1939-1949.

39. Hebert GA, Cooksey RC, Clark NC, Hill BC, Jarvis WR, and Thornsberry C. Biotyping CoagulaseNegative Staphylococci. Journal of Clinical Microbiology

1988;26:1950-1956.

40. Marcus RA and the CDC Cooperative Needlestick Surveillance Group (Jarvis WR). Surveillance of HealthCare Workers Exposed to Blood from Patients Infected with Human Immunodeficiency Virus. New England Journal of Medicine 1988;319:1118-1123.

41. Tipple MA, Bland LA, Favero MS, and Jarvis WR. Investigation of Hemolytic Anemia After Chloramine Exposure in a Dialysis Center. Transactions of the American Society for Artificial and Internal Organs 1988;34:1060.

42. BeckSague CM and Jarvis WR. Epidemic Bloodstream Infection Associated with Pressure Transducers: A Persistent Problem. Infection Control and Hospital Epidemiology 1989;10:54-59.

43. Richet HM, McNeil MM, Edwards MC and Jarvis WR. Cluster of *Malassezia furfur* Pulmonary Infections in Infants in a Neonatal Intensive Care Unit. Journal of Clinical Microbiology 1989;27:11971200.

44. Arduino MJ, Bland LA, Tipple MA, Aguero SM, Favero MS, and Jarvis WR. Growth and Endotoxin Production of *Yersinia enterocolitica* and *Enterobacter agglomerans* in Packed Erythrocytes. Journal of Clinical Microbiology 1989;27:1483-1485.

45. Rabkin CS, Jarvis WR, Anderson RL, Govan J, Klinger J, LiPuma J, Martone WJ, Montiel H, Richard C, Shigeta S, Sosa A, Stull T, Swenson JM, and Woods D. *Pseudomonas cepacia* Typing Systems: Collaborative Study to Assess Their Potential in Epidemiologic Investigations. Reviews of Infectious Diseases 1989;2:600-608.

46. Villarino ME, Jarvis WR, O'Hara C, Bresnehan J, and Clark N. Epidemic of *Serratia marcescans* Bacteremia in a Cardiac Intensive Care Unit. Journal of Clinical Microbiology 1989;27:2433-2436.

47. Kelkar R. Gordon SM, Giri N, Rao K, Ramakrishnan G, Saikia T, Nair C.N., Kurkure PA, Pai SK, Jarvis WR, and Advani SH. Epidemic Iatrogenic Acinetobacter sp. Meningitis Following Administration of Intrathecal Methotrexate. Journal of Hospital

Infection 1989;14:233-243.

48. Pegues DA, Arduino MJ, Bland LA, and Jarvis WR. Infectious Complications of Continuous Ambulatory Peritoneal Dialysis. Asepsis 1989;11:613.

49. Lowry PW, BeckSague CM, Bland LA, Aguero SM, Arduino MJ, Minuth AN, Murray RA, Swenson JM, and Jarvis WR. *Mycobacterium chelonae* Infections

Among Patients Receiving HighFlux Dialysis in a Hemodialysis Clinic, California. Journal of Infectious Diseases 1990;161:85-91.

50. Gordon SM, Bland LA, Alexander S, Newman HF, Arduino MJ and Jarvis WR. Hemolysis Associated with Hydrogen Peroxide at a Pediatric Dialysis Center. American Journal of Nephrology 1990;10:123-127.

51. Gordon SM, Culver DH, Simmons BP and Jarvis WR. Multivariate Analysis of Risk Factors for Surgical Wound Infections After Total Knee Arthroplasty Procedures. American Journal of Epidemiology 1990;131:905-911.

52. Tipple MA, Murphy JJ, Bland LA, Bufill JA, Ritch PS, Archer JR, Arduino M, Farmer JJ, Menitors JE, Johnson PS, Tourault MA, Tablan OC, and Jarvis WR. Sepsis Associated with Transfusion of Red Blood Cells Contaminated with *Yersinia enterocolitica*. Transfusion 1990;30:207-213.

53. Gordon SM, Drachman J, Bland LA, Reid MH, Favero MS, and Jarvis WR. Epidemic Hypotension in a Dialysis Center Caused by Sodium Azide. Kidney International 1990;10:123-127.

54. Gordon SM, Oshiro LS, Jarvis WR, Donenfeld D, Ho MS, Taylor F, Greenberg H, Glass RIM, Madore HP, Dolan R, Tablan O. Foodborne Snow Mountain Agent Gastroenteritis with Secondary Person to Person Spread in a Retirement Community. American Journal of Epidemiology 1990;131:702-710.

55. Beck-Sague CM, Jarvis WR, Brook JP, Culver DH, Potts A, Gay E, Shotts BW, Hill B, Anderson RL and Weinstein MP. Epidemic Bacteremia Due to *Acinetobacter baumanni* in five intensive care units. American Journal of Epidemiology 1990;132:723-733.

56. McNeil MM, Brown JM, Jarvis WR, and Ajello L. A Comparison of Species and Antimicrobial Susceptibility of Aerobic Actinomycetes From Clinical Specimen. Reviews of Infectious Diseases 1990;12:778-783.

57. Tokars JI, McNeil MM, Tablan OC, Chapin-Robertson K, Evans Patterson J, Edberg SC, Hierholzer W, and Jarvis WR. *Mycobacterium gordonae* Pseudoinfection Associated with A Contaminated Antimicrobial Solution. Journal of Clinical Microbiology 1990:28;2765-2769.

58. BeckSague CM, Jarvis WR, Bland LA, Arduino MJ, Aguero SM, and Verosec G. Outbreak of GramNegative Bacteremia and Pyrogenic Reactions in a Hemodialysis Center. American Journal of Nephrology 1990;10:397-403.

59. Richet HM, Craven PC, Brown JM, Lasker BA, Cox CD, McNeil MM, Tice AD, Jarvis WR, and Tablan OC. *Rhodococcus (Gordona) bronchialis* Sternal Wound

Infections Following Coronary Artery Bypass Graft Surgery. New England Journal of Medicine 1991:324;104-109.

60. Emori TG, Culver DH, Horan TC, Jarvis WR, White JW, Banerjee SN, White JW, Edwards JR, Martone WJ, Gaynes RP, Olsen DR, and Hughes JM. National Nosocomial Infections Surveillance System (NNIS): Description of Methodology and Surveillance Components. American Journal of Infection Control 1991;19:1936.

61. Richet HM, Andremont A, Tancrede C, Pico JL and Jarvis WR. Risk Factors for Candidemia in Patients with Acute Lymphocytic Leukemia. Reviews of Infectious Diseases 1991;13:211-215.

62. Panlilio AL, Foy DR, Edwards JR, Bell DM, Welch BA, Parrish CM, Culver DH, Lowry PW, Jarvis WR, and Perlino CA. Blood Contacts During Surgical Procedures. Journal of the American Medical Association 1991;265:1533-1539.

63. Froelich H and Jarvis WR. The Economic Impact of Diagnosis Related Groups and Severity of Illness on Reimbursement for Central Nervous System Infection. Journal of Pediatrics 1991;118:693-697.

64. Lowry PW and Jarvis WR. Use of Tap Water and Disinfectant Practices in Outpatient Settings: A Survey of Otolaryngologists. Archives of Otolaryngology Head Neck Surgery 1991;11:881-888.

65. Beck-Sague CM, Jarvis WR, Fruehling JA, Ott CE, Higgens MT, Bates FE. Universal Precautions Among Mortuary Practitioners: Influence on Practices and Risk of Occupationally acquired Infection. Journal of Occupational Medicine 1991;33:874-878.

66. Pegues DA, Shirley LA, Riddle CF, Anderson RL, Vess RW, Hill BC, and Jarvis WR. *Serratia marcescans* Surgical Wound Infections Following Breast Reconstruction.
American Journal of Medicine 1991;91:173S-178S.

67. Richet HM, Chidiac C, Prat A, Pol A, Guyot L, David M, Maccario M, Jarvis WR. Risk Factors for Surgical Wound Infections Following Vascular Surgery. American Journal of Medicine 1991;91:170S-172S.

68. Gaynes R, Culver DH, Emori TG, Horan TC, Banerjee SN, Edwards JR, Jarvis WR, Tolson JS, Henderson TS, Hughes JM, and Martone WJ. The National Nosocomial Infections Surveillance System: Plans for the 1990's and Beyond. American Journal of Medicine 1991;91:116S-120S.

69. Jarvis WR and The Epidemiology Branch. Nosocomial Outbreaks: The Centers for

Disease Control, Hospital Infections Program Experience, 1980-1990. American Journal of Medicine 1991;91:101S-106S.

70. Marcus RA, Favero MS, Banerjee S, Solomon SL, Bell DM, Jarvis WR, Martone WJ, and the Cooperative Dialysis Study Group. HIV Prevalence and Incidence Among Patients Undergoing Chronic Hemodialysis. American Journal of Medicine 1991;90:614-619.

71. Jarvis WR, Edwards JR, Culver DH, Hughes JM, Horan T, Emori TG, Banerjee SN, Tolson J, Henderson T, Gaynes RP, Martone WJ, and the National Nosocomial Infections Surveillance System. Nosocomial Infection Rates in Adult and Pediatric Intensive Care Units. American Journal of Medicine 1991;91:185S-191S.

72. Gaynes RP, Martone WJ, Culver DH, Emori TG, Horan TC, Banerjee SN, Edwards JE, Jarvis WR, Tolson JS, Henderson TS, Hughes JM, and the National Nosocomial Infections Surveillance System. Comparison of Rates of Nosocomial Infections in Neonatal Intensive Care Units in the United States. American Journal of Medicine 1991;91:192S-197S.

73. Culver DH, Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG, Banerjee SN, Edwards JE, Tolson JS, Henderson TS, Hughes JM, and the National Nosocomial Infections Surveillance System. Surgical Wound Infection Rates By Wound Class, Operative Procedure, and Patient Risk Index. American Journal of Medicine 1991;91:152S-157S.

74. Emori TG, Banerjee SN, Culver DH, Gaynes RP, Horan TC, Edwards JE, Jarvis WR,

Tolson TS, Henderson TS, Martone WJ, Hughes JM, and the National Nosocomial Infections Surveillance System. Nosocomial Infections in Elderly Patients in the United States, 1986-1990. American Journal of Medicine 1991;91:289S-293S.

75. Banerjee SN, Emori TG, Culver DH, Gaynes RP, Jarvis WR, Horan TC, Edwards JE, Tolson TS, Henderson TS, Martone WJ. Secular Trends in Nosocomial Primary Bloodstream Infections in the United States, 1980-1990. American Journal of Medicine 1991;91:286S-289S.

76. Rosenblum LS, Villarino ME, Nainan O, Melish ME, Hadler SC, Pinsky PP, Jarvis WR, Ott CE, and Margolis HS. Prolonged Virus Excretion Among Preterm Infants in a Hepatitis A Outbreak in a Neonatal Intensive Care Unit. Journal of Infectious Diseases 1991;164:476-482.

77. Arduino MJ, Bland LA, McAllister SK, Aguero SM, Villarino ME, McNeil M, Jarvis WR, and Favero MS. Microbial Growth and Endotoxin Production in the Intravenous Anesthetic Propofol. Infection Control and Hospital Epidemiology

1991;12:535-539.

78. Tipple MA, Schusterman N, Bland LA, McCarthy MA, Favero MA, Reid MH and Jarvis WR. Illness in Hemodialysis Patients After Exposure to Chloramine Contaminated Dialysate. Transactions of the American Society for Artificial and Internal Organs 1991;37:588-591.

79. National Nosocomial Infections Surveillance (NNIS) System (includes WR Jarvis). Nosocomial Infection Rates for Interhospital Comparison: Limitations and Possible Solutions. Infection Control and Hospital Epidemiology 1991;12:609-621.

80. Jarvis WR and Martone WJ. Predominant Pathogens in Hospital Infections. Journal of Antimicrobial Chemotherapy 1991;28:15-19.

81. Richet HM, McNeil MM, Davis BJ, Duncan E, Strickler J, Nunley D, Jarvis WR, and Tablan OC. *Aspergillus fumigatis* Sternal Wound Infection in Patients Undergoing OpenHeart Surgery. American Journal of Epidemiology 1992:135;48-58.

82. Villarino ME, Stevens L, Schable B, Mayers G, Evershed S, Miller M, Burke JP, and Jarvis WR. Epidemic *Xanthamonas maltophilia* Infections and Colonization in an Intensive Care Unit. Infection Control and Hospital Epidemiology 1992;13:201-206.

83. Panlilio A, BeckSague CM, Siegel J, Anderson RL, Yetts S, Clark N, Duer P, Thomassen KA, Vess RN, Hill B, Tablan OC, and Jarvis WR. Infections and

Pseudoinfections Due to PovidoneIodine Solution Contaminated with *Pseudomonas cepacia*. Clinical Infectious Diseases 1992;14:1078-83.

84. Gordon SM, Oettinger C, Bland LA, Oliver JC, Arduino M, Aguero SM, McAllister SK, Favero MS, and Jarvis WR. A Prospective Study of Pyrogenic Reactions in Patients Receiving Conventional, High-Efficiency, or High-Flux Hemodialysis Treatments with Bicarbonate Dialysate Containing High Concentrate of Bacteria and Endotoxin. Journal of the American Society of Nephrology 1992;2:1436-1444.

85. Bland LA, Villarino ME, Arduino MJ, McAllister SK, Gordon SM, Uyeda CT, Valdon C, Potts D, Jarvis WR, and Favero MS. Bacteriologic and Endotoxin Analysis of Salvaged Blood Used in Autologous Transfusions During Cardiac Operations. The Journal of Thoracic and Cardiovascular Surgery 1992;103:582-588.

86. Auerbach SB, McNeil MM, Brown JM, Lasker BA, and Jarvis WR. Outbreak of Pseudoinfection with *Tsukamurella paurametabolum* Traced to Laboratory Contamination: Efficacy of a Joint Epidemiologic and Laboratory Investigation. Reviews of Infectious Diseases 1992;14:1015-1022.

87. Villarino ME, Gordon SM, Valdon C, Potts D, Fisk K, Uyeda C, McCarthy PM,

Bland LA, Anderson RL. and Jarvis WR. A Cluster of Severe Postoperative Bleeding Following Open Heart Surgery. Infection Control and Hospital Epidemiology 1992;13:282-288.

88. Dooley SW, Villarino ME, Lawrence M, Salinas L, Amil S, Rullan JV, Jarvis WR, Bloch AB, and Cauthen GM. Tuberculosis in a Hospital Unit for Patients Infected with the Human Immunodeficiency Virus (HIV): Evidence of Nosocomial Transmission. Journal of the American Medical Association 1992;267:2632-2634.

89. Edlin BR, Tokars JI, Grieco MH, Crawford JT, Williams J, Sordillo EM, Ong KR, Kilburn JO, Dooley SW, Castro KG, Jarvis WR, and Holmberg SD. An Outbreak of Multidrug-Resistant Tuberculosis Among Hospitalized Patients with the Acquired Immunodeficiency Syndrome: Epidemiologic Studies and Restriction Fragment Length Polymorphism Analysis. New England Journal of Medicine 1992;326:1514-1522.

90. McNeil MM, Gerber AR, McLaughlin DW, Vega RA, Winn K, Kaufman L, Keyserling HL, and Jarvis WR. The Role of the Mannan Enzymelinked Immunoassay in Diagnosing Invasive Candidiasis and Evaluating Therapy. Pediatric Infectious Diseases Journal 1992;11:493-495.

91. Schable B., Rhoden DL, Jarvis WR, and Miller JM. Prevalence of Serotypes of *Xanthomonas maltophilia* From World-wide Sources. Journal of Epidemiology and Infection 1992;108:337-341.

92. Pearson ML, Jereb JA, Frieden TR, Crawford JT, Davis B, Dooley SW, and Jarvis WR. Nosocomial Transmission of Multidrug-Resistant *Mycobacterium tuberculosis*: A Risk to Hospitalized Patients and Health-care Workers. Annals of Internal Medicine 1992;117:191-196.

93. Gordon S, Swenson JM, Hill BC, Pigott NE, Facklam RR, Cooksey RC, Thornsberry C, Enterococcal Study Group, Jarvis WR, and Tenover FC. Antimicrobial Susceptibility Patterns of Common and Unusual Species of Enterococci Causing Infections in the United States. Journal of Clinical Microbiology 1992;30:2373-2378.

94. Auerbach SB, Swartz B, Williams D, Fiorilli MG, Adimora AA, Breiman RF, and Jarvis WR. Outbreak of Invasive Group A Streptococcal Infections in a Nursing Home: Lessons on Prevention and Control. Archives of Internal Medicine 1992;152:1017-1022.

95. Beck-Sague CM, Dooley SW, Hutton MD, Otten J, Breeden A, Crawford JT, Pitchenik AE, Woodley C, Cauthen G, and Jarvis WR. Outbreak of Multidrug-Resistant Tuberculosis among Persons with HIV Infection in an Urban Hospital: Transmission to Staff and Patients and Control Measures. Journal of the American Medical Association 1992;268:1280-1286.

96. BeckSague CM, Chong W, Roy C and Jarvis WR. Outbreak of Surgical Wound Infections Associated With Total Hip Arthroplasty Procedures. Infection Control and Hospital Epidemiology 1992;13:526-535.

97. Horan TC, Gaynes RP, Martone WJ, Jarvis WR and Emori TG. CDC Definitions of Nosocomial Surgical Site Infections, 1992. Infection Control and Hospital Epidemiology 1992;13:606-609.

98. Sheretz RJ, Garibaldi RA, Kaiser AB, Marosok RD, Mayhill CG, Scheckler WE, Berg R, Gaynes RP, Jarvis WR, Martone WJ, and Lee JT. Consensus Paper on the Surveillance of Surgical Wound Infections. Infection Control and Hospital Epidemiology 1992;13:599-606.

99. Horan TC, Gaynes RP, Martone WJ, Jarvis WR, and Emori TG. CDC Definitions of Nosocomial Surgical Site Infections, 1992: A Modification of CDC Definitions of Surgical Wound Infections. American Journal of Infection Control 1992;20:271-275.

100. Sheretz RJ, Garibaldi RA, Marosok RD, Mayhill CG, Scheckler WE, Berg R, Gaynes RP, Jarvis WR, Martone WJ, and Lee JT. Consensus Paper on the Surveillance of Surgical Wound Infections. American Journal of Infection Control 1992;20:263-270.

101. Pegues DA, Oettinger CW, Bland LA, Oliver JL, Arduino MJ, Aguero SM, McAllister SK, Gordon SM, Favero MS, and Jarvis WR. A Prospective Study of Pyrogenic Reactions in Hemodialysis Patients using Bicarbonate Dialysis Fluids Filtered to Remove Bacteria and Endotoxin. Journal of the American Society of Nephology 1992;4:1002-1007.

102. Pegues DA, Beck-Sague C, Woollen SW, Greenspan B, Burns SM, Mackaw RC, Bland LA, Arduino M, Favero MS, and Jarvis WR. Anaphylactic Reactions Associated with Reuse of Disposable Hollow-fiber Dialyzers. Kidney International 1992;42:1232-7.

103. Horan TC, Culver DH, Gaynes RP, Jarvis WR, Edwards JR, Reid CR, and The National Nosocomial Surveillance System. Nosocomial Infection in Surgical Patients in the United States, 1986-1990. Infection Control and Hospital Epidemiology 1993;14:73-80.

104. Jarvis WR. Nosocomial Transmission of Multidrug-Resistant *Mycobacterium tuberculosis*. Research in Microbiology 1993;144:117-122.

105. Pegues DA, Carson LA, Anderson RL, Norgerd MD, Argent TA, Jarvis WR, and Woernle CH. Outbreak of *Pseudomonas cepacia* Bacteremia in Oncology Patients. Clinical Infectious Diseases 1993;16:407-412.

106. Beck-Sague CM, Jarvis WR, and the National Nosocomial Infections Surveillance System. Secular Trends in the Epidemiology of Nosocomial Fungal Infections in the United States, 19801990. Journal of Infectious Diseases 1993;167:1247-1252.

107. Coronado VG, Beck-Sague CM, Pearson ML, Dooley SW, Valway SE, Pineda MR, and Jarvis WR. Clinical and Epidemiologic Characteristics of Multidrug-Resistant *Mycobacterium tuberculosis* Among Patients with Human Immunodeficiency Virus (HIV) Infection. Infectious Diseases in Clinical Practice 1993;2:297-302.

108. Tenover FC, Tokars J, Swenson J, Paul S, Spitalny K. and Jarvis W. Ability of Clinical Laboratories to Detect Antimicrobial-resistant Enterococci. Journal of Clinical Microbiology 1993;31:1695-1699.

109. Pearson ML, Pegues DA, Carson LS, O'Donnell R, Berger RH, Anderson RL, and Jarvis WR. Cluster of *Enterobacter cloacae* Pseudobacteremias Associated with Use of an Agar Slant Blood Culturing System. Journal of Clinical Microbiology 1993;31:2599-2603.

110. Coronado VG, Beck-Sague CM, Hutton MD, Davis BJ, Nicholas P, Villareal C, Woodley CL, Kilburn JO, Crawford JT, Frieden TR, Sinkowitz RL, and Jarvis WR. Transmission of Multidrug-Resistant *Mycobacterium tuberculosis* Among Persons with Human Immunodeficiency Virus Infection in an Urban Hospital: Epidemiologic and Restriction Fragment Length Polymorphism Analysis. Journal of Infectious Diseases 1993;168:1052-1055.

111. Jereb J, Burwen D, Dooley S, Jarvis W, Wooley C, Crawford J, Edmund M, Dowling J, Pasculle A, Medrick J, Shapiro R, and Shanahan S. Nosocomial Outbreak of Tuberculosis on a Renal Transplant Unit. Journal of Infectious Diseases 1993;168:1219-1225.

112. Beck-Sague C, Banerjee S, and Jarvis WR. Infectious Diseases and Mortality Among U.S. Nursing Home Residents. American Journal of Public Health 1993;83:1739-1743.

113. Tenover F, Arbeit R, Archer G, Biddle J, Byrne S, Goering R, Hancock G, Hebert A, Hill B, Hollis R, Jarvis W, Kreiswirth B, Maslow J, McDougal L, Miller JM, Mulligan M, and Pfaller M. Comparison of Traditional and Molecular Methods of Typing of *Staphylococcus aureus* Isolates. Journal of Clinical Microbiology 1994;32:407-415.

114. Pearson ML, Cole JS, and Jarvis WR. How Common is Latex Allergy? A Survey of Children with Myelodysplasias. Journal of Developmental Medicine and Child

Neurology 1994;36:64-69.

115. Nelson DE, Auerbach SB, Baltch AL, Desjardin E, Beck-Sague C, Rheal C, Smith RP, and Jarvis WR. Epidemic *C. difficile*-associated Diarrhea: Role of Second and Third Generation Cephalosporins. Infection Control and Hospital Epidemiology 1994;15:88-95.

116. Zaza S, Tokars JI, Jarvis WR, Bland LA, Yomtovian R, Hirschler N, Jacobs MR, Arduino M, Aguerro S, and Sharp DE. Bloodstream Infections Associated with

Transfusion of Random Donor Platelet Pools. Infection Control and Hospital Epidemiology 1994;15:82-88.

117. Mancao MY, Nolte FS, Nahmias AJ and Jarvis WR. Use of Polymerase Chain Reaction for Diagnosis of Tuberculous Meningitis. Pediatric Infectious Disease Journal 1994;12:154-156.

118. Welbel SF, McNeil M. Pramanik A, Silberman R, Oberle A, Midgley G, Crow S, and Jarvis WR. Nosocomial *Malassezia pachydermetis* Bloodstream Infections in a Neonatal Intensive Care Unit. Pediatric Infectious Diseases Journal 1994;13:104-109.

119. Jarvis WR. Nosocomial Outbreaks of International Significance. In Sterilization of Medical Products, Editor R.F. Morrison, Vol II, P55-62, 1993.

120. Pegues DA, Arathoon E, Samayoa B, Del Valle G, Anderson RL, Riddle CF, O'Hara C, Miller M, Hill B, Highsmith A and Jarvis WR. Epidemic Gram-negative Bacteremia in a Neonatal Intensive Care Unit, Guatemala. American Journal of Infection Control 1994;6:163-171.

121. McAllister SK, Bland LA, Arduino MJ, Aguero SM, Wenger PN, and Jarvis WR. Patient Cytokine Response in Transfusion-Associated Sepsis. Infection and Immunity 1994;62:2126-2128.

122. Maloney S, Welbel S, Daves B, Adams K, Becker S, Risch P, Bland LA, Arduino MJ, Wallace R, Zhang Y, Buck G, and Jarvis WR. *Mycobacterium abscessus* Pseudoinfection Traced to an Automated Endoscope Washer: Utility of Epidemiologic and laboratory Investigation. Journal of Infectious Diseases 1994;169:1166-1169.

123. Pegues DA, Carson LA, Tablan OC, Fitzsimmons SC, Roman SB, Miller JM, Jarvis WR, and the Summer Camp Study Group. Acquisition of *Pseudomonas cepacia* at Summer Camps for Patients with Cystic Fibrosis. Journal of Pediatrics 1994;124:694-702.

124. Buffington J, Reporter R, McNeil MM, Ross L, Lanson J, Davis B, and Jarvis WR. An Outbreak of Invasive Aspergillosis Among Hematology and Bone Marrow Transplant Patients at a Los Angeles Hospital. Journal of Pediatric Infectious Diseases 1994;13:386-393.

125. Jarvis WR. Usefulness of Molecular Epidemiology for Outbreak Investigations.

Journal of Infection Control and Hospital Epidemiology 1994;15:500-503.

126. Jackson BM, Beck-Sague CM, Bland LA, Arduino MJ, Meyer L, and Jarvis WR. Pyrogenic Reactions and Gram-negative Bacteremia in a Hemodialysis Center. American Journal of Nephrology 1994;14:85-89.

127. Beck-Sague CM, Villarino ME, Giuliano D, Welbel S, Latts L, Manangan LM, Sinkowitz R, and Jarvis WR. Infectious Diseases and Death Among Nursing Home Residents: Results of Surveillance in 13 Nursing Homes. Infection Control and Hospital Epidemiology 1994;15:494-496.

128. Pegues DA, Schidlow DV, Tablan OC, Carson LA, Clark NC, and Jarvis WR. Possible Nosocomial Transmission of *Pseudomonas cepacia* in Cystic Fibrosis Patients. Archives of Pediatric and Adolescent Medicine. 1994;148:805-812.

129. Kelly JK, Pearson ML, Kurup VP, Byrd RS, Setlock MA, Slater JC, Jarvis WR, Davis JP, and Fink JN. Epidemiologic Features, Risk Factors and Latex Hypersensitivity in Patients with Spina Bifida Who Develop Anaphylactic Reactions During General Anesthesia. American Journal of Clinical Allergy and Immunology 1994;94:53-61.

130. Zaza S, Reeder JM, Yalew L, and Jarvis WR. Latex Sensitivity Among Perioperative Nurses. Journal of the Association of Operating Room Nurses 1994;60:1-6.

131. Beck-Sague CM, Azimi P, Fonseca SN, Baltimore RS, Powell DA, Bland LA, Arduino MJ, McAllister SK, Huberman RS, Sinkowitz RL, Ehrenkranz RA, and Jarvis WR. Bloodstream Infections in Neonatal Intensive Care Unit Patients: Results of a Multicenter Study. Journal of Pediatric Infectious Diseases 1994;13:1110-1116.

132. Maloney SM, Pearson ML, Gordon MT, Del Castillo R, Boyle JF, and Jarvis WR. Efficacy of Control Measures in Preventing Transmission of Multidrug-Resistant Tuberculosis to Patients and Health Care Workers. Annals of Internal Medicine 1995;122:90-95.

133. Jarvis WR, Bolyard EA, Bozzi CJ, Burwen DR, Dooley SW, Martin LS, Mullan RJ, and Simone PM. Respirators, Recommendations, and Regulation: Controversy Surrounding Protection of Health Care Workers from Tuberculosis. Annals of

Internal Medicine 1995;122:142-146.

134. Jarvis WR. Trends for Nosocomial Infection of the Future. Proceedings of the Third

Western Pacific Congress on Chemotherapy and Infectious Diseases - Bali, Indonesia pp 49-54, 1994.

135. Wenger P, Otten J, Breeden A, Orfas D, Beck-Sague CM, and Jarvis WR. Control of Nosocomial Transmission of Multidrug-resistant *Mycobacterium tuberculosis* Among Healthcare Workers and HIV-Infected Patients. Lancet 1995;345:235-240.

136. Fridkin SK, Manangan L, Bolyard E, SHEA, and Jarvis WR. Society for Hospital Epidemiology of America - Centers for Disease Control and Prevention TB Survey - Part I: Current Status of TB Infection Control Programs at Member Hospitals, 1989-1992. Infection Control and Hospital Epidemiology 1995;16:129-135.

137. Fridkin SK, Manangan L, Bolyard E, SHEA, and Jarvis WR. Society for Hospital Epidemiology of America - Centers for Disease Control and Prevention TB Survey - Part II: Efficacy of TB Infection Control Programs at Member Hospitals, 1989-1992. Infection Control and Hospital Epidemiology 1995;16:135-140.

138. Stroud LA, Tokars JI, Grieco MH, Crawford JT, Culver DH, Edlin BR, Sordillo EM, Woodley CL, Gilligan ME, Schneider N, Williams J, and Jarvis WR. Evaluation of Infection Control Measures in Preventing the Nosocomial Transmission of Multidrug-Resistant *Mycobacterium tuberculosis* in a New York City Hospital. Infection Control and Hospital Epidemiology 1995;16:141-147.

139. Jarvis WR. Nosocomial Transmission of Multidrug-Resistant *Mycobacterium tuberculosis*. American Journal of Infection Control 1995;23:146-151.

140. Welbel SF, Schoendorf K, Bland LA, Arduino MJ, Groves C, Schable B, O'Hara CM, Tenover FC, and Jarvis WR. An Outbreak of Gram-negative Bacteremia in Chronic Hemodialysis Patients. American Journal of Nephrology 1995;15:1-4.

141. Danzig LE, Short LM, Collins K, Mahoney M, Sepe S, Bland L, and Jarvis WR. Bloodstream Infections Associated with a Needleless Intravenous Infusion System in Patients Receiving Home Infusion Therapy. The Journal of American Medical Association 1995;273:1862-1864.

142. Bennett SN, McNeil MM, Bland LA, Arduino MJ, Villarino ME, Perrotta DM, Burwen DA, Welbel SF, Pegues DA, Stroud L, Zeitz PS, and Jarvis WR. Multiple Outbreaks of Postoperative Infections Traced to Extrinsic Contamination of an Intravenous Anesthetic, Propofol. The New England Journal of Medicine 1995;333:147-154.

143. Jereb JA, Klevins RM, Privett TD, Smith PJ, Crawford JT, Sharp VL, Davis BJ, Jarvis WR, Dooley SW. Tuberculosis in Health Care Workers at a Hospital with an Outbreak of Multidrug-Resistant *Mycobacterium tuberculosis*. The Archives of Internal Medicine 1995;155:854-859.

144. Burwen DR, Olsen SM, Bland LA, Arduino MJ, Reid MR, and Jarvis WR. Epidemic Aluminum Intoxication in Hemodialysis Patients Traced to Use of an Aluminum Pump. Kidney International 1995;48:469-474.

145. Shay DK, Maloney SM, Montecalvo M, Banerjee S, Wormser GP, Arduino MJ, Bland LA, and Jarvis WR. Epidemiology and Mortality of Vancomycin-Resistant Enterococcal Bloodstream Infections. Journal of Infectious Diseases 1995;172:993-1000.

146. Hospital Infection Control Practices Advisory Committee, Tablan OC, Tenover FC, Martone WJ, Gaynes RF, Jarvis WR, and Favero MS. Recommendations for Preventing the Spread of Vancomycin Resistance: Recommendations of the Hospital Infection Control Practices Advisory Committees (HICPAC). American Journal of Infection Control 1995;23:87-94.

147. Jarvis WR. Epidemiology of Nosocomial Fungal Infections, with Emphasis on Candida species. Clinical Infectious Diseases 1995;20:1526-1530.

148. Valendia MP, Fridkin SK, Cardenas VM, Boshell J, Rameriz G, Bland LA, Iglesias A, and Jarvis WR. Transmission of Human Immunodeficiency Virus in a Dialysis Center. Lancet 1995;345:1417-1422.

149. Moran GJ, Fuchs MA, Jarvis WR and Talan DA. Tuberculosis Infection Control Practices in United States Emergency Departments. Annals of Emergency Medicine 1995;26:283-289.

150. Morris Jr. JG, Shay DK, Hebden JN, McCarter RJ Jr., Perdue BE, Jarvis WR, Johnson JA, Dowling TC, Polish LB, and Schwalbe RS. Enterococci Resistant to Multiple Antimicrobial Agents, Including Vancomycin: Establishment of Endemnicity in a University Medical Center. Annals of Internal Medicine 1995;123:250-259.

151. Pertowski CA, Baron RC, Lasker B, Werner SB and Jarvis WR. Nosocomial Outbreak of *Candida albicans* Sternal Wound Infection Following Cardiac Surgery Traced to a Scrub Nurse. Journal of Infectious Diseases 1995;172:817-822.

152. Rudnick JR, Arduino MJ, Bland LA, Cusack L, McAllister SK, Aguero SM, and Jarvis WR. An Outbreak of Pyrogenic Reactions in Chronic Hemodialysis Patients

Associated with Hemodialyzer Reuse. Transactions of the American Society of the Artificial and Internal Organs 1995;19:289-294.

153. Zaza S, Blumberg HM, Beck-Sague C, Haas WH, Woodley C, Pineda M, Parrish C, Crawford JT Jr, McGowan JE Jr, and Jarvis WR. Nosocomial Transmission of *Mycobacterium tuberculosis*: Role of Healthcare Workers in Outbreak Propagation. Journal of Infectious Diseases 1995;172:1542-1549.

154. Hospital Infection Control Practices Advisory Committee, Tablan OC, Martone WJ, Jarvis WR, Tenover FC, Gaynes RF, and Favero MS. Preventing the Spread of Vancomycin Resistance. Infection Control and Hospital Epidemiology 1995;16:105-113.

155. Tokars JI, Rudnick JR, Kroc K, Manangan L, Pugliese G, Hubner RE, Chan J, and Jarvis WR. U.S. Hospital Mycobacterlogy Laboratories: Status and Comparison with State Public Health Laboratories. Journal of Clinical Microbiology 1996;34:680-685.

156. Rudnick JR, Beck-Sague CM, Anderson RL, Schable B, Miller JM, and Jarvis WR. Gram-negative Bacteremia in Open Heart Surgery Patients Traced to Probable Tap-Water Contamination of Pressure Monitoring Equipment. Infection Control and Hospital Epidemiology 1996;17:272-275.

157. Chang HJ, Christenson JC, Pavia AT, Bobrin BD, Bland LA, Carson LA, Arduino MJ, Verma P, Aguero SM, Carroll K, Jenkins E, Doly JA, Woods ML, and Jarvis WR. *Ochrabactrum anthropi* Meningitis in Pediatric Pericardial Allograft Transplant Recipients. The Journal of Infectious Diseases 1996;173:656-660.

158. Fridkin SK, Kremer FB, Bland LA, Padhye A, McNeil MM, and Jarvis WR. *Acremonium kiliense* Endophthalmitis That Occurred After Cataract Extraction in an Ambulatory Surgical Center and Was Traced to an Environment Reservoir. Clinical Infection Diseases 1996;22:222-227.

159. Jarvis WR. The Epidemiology of Colonization. Infection Control and Hospital Epidemiology 1996;17:47-52.

160. Fridkin SK, Pear SM, Williamson TH, Galgiani JN, and Jarvis WR. The Role of Understaffing in Central Venous Catheter-Associated Bloodstream Infections.

Infection Control and Hospital Epidemiology 1996;17:150-158.

161. Beck-Sagué CM, Sinkowitz RL, Chinn RY, Vargo J, Kaler W, and Jarvis WR. Risk Factors for Ventilator-associated Pneumonia in Surgical Intensive Care Unit Patients. Infection Control and Hospital Epidemiology 1996;17:374-376.

162. Montecalvo MA, Shay DK, Patel P, Tacsa L, Maloney SA, Jarvis WR, and Wormser GP. Bloodstream Infections with Vancomycin-resistant Enterococci. Archives of Internal Medicine 1996;156:1458-1462.

163. Gaynes RP, Edwards JR, Jarvis WR, Culver DH, Tolson JS, Martone WJ, and The National Nosocomial Infections Surveillance System. Nosocomial Infections Among Neonates in High Risk Nurseries in the United States. National Nosocomial Infections Surveillance System. Pediatrics 1996;98:357-361.

164. Sinkowitz RL, Fridkin SK, Manangan L, Wenger PN, APIC, and Jarvis WR. Status of Tuberculosis Infection Control Programs at United States Hospitals, 1989-1992. American Journal of Infection Control 1996;24:226-234.

165. Jarvis WR. Preventing the Emergence of Multidrug-Resistant Microorganisms Through Antimicrobial Use Controls: The Complexity of the Problem. Infection Control and Hospital Epidemiology 1996;17:490-495.

166. Jarvis WR. Selected Aspects of the Socioeconomic Impact of Nosocomial Infections: Morbidity, Mortality, Cost, and Prevention. Infection Control and Hospital Epidemiology 1996;17:552-558.

167. Welbel SF, McNeil MM, Kuykendall RJ, Lott TJ, Pramanik A, Silberman R, Oberle AD, Bland LA, Aguero SM, Arduino M, Crow S, and Jarvis WR. *Candida parapsilosis* Bloodstream Infections in Neonatal Intensive Care Unit Patients: Epidemiologic and Laboratory Confirmation of a Common Source Outbreak. Journal of Pediatric Infectious Diseases 1996;15:998-1002.

168. Kellerman S, Shay D, Howard J, Feusner J, Rosenberg J, Vugia D, and Jarvis W. Bloodstream Infections in Home Infusion Patients: the Influence of Race and Needleless Intravascular Access Devices. Journal of Pediatrics 1996;129:711-717.

169. Fridkin SK and Jarvis WR. Epidemiology of Nosocomial Fungal Infections. Clinical Microbiology Reviews 1996;9:499-511.

170. Singer DA, Jochimsen EM, Gielarek P, and Jarvis WR. Pseudo-outbreak of *Enterococcus durans* Infections and Colonization Associated with the Introduction of an Automated Identification System Software Update. Journal of Clinical Microbiology 1996;34:2685-2687.

171. Beck-Sague CM, Jarvis WR, and Martone WJ. Outbreaks Investigations. Infection Control and Hospital Epidemiology 1997;18:138-145.

172. Passaro DJ, Waring L, Armstrong R, Bolding F, Bouvier B, Rosenberg J, Reingold WA, McQuitty M, Philpott SM, Jarvis WR, Werner SB, Tompkins LS, and Vugia DJ.

Postoperative *Serratia marcescens* Wound Infections Traced to an Out-of-Hospital Source. Journal of Infectious Diseases 1997;175:992-995.

173. Zaza S, Beck-Sague CM, and Jarvis WR. Tracing Patients Exposed to Health Care Workers with Tuberculosis. Public Health Reports 1997;12:153-157.

174. Shay D, Jarvis WR, and The National Nosocomial Infections Surveillance System. Infections Acquired in the Intensive Care Unit: The Experience of the National Nosocomial Infections Surveillance System.

175. Ashford DA, Kellerman S, Yakrus M, Brim S, Good RC, Finelli L, Jarvis WR, and McNeil M. Pseudo-Outbreak of Septicemia Due to Rapidly Growing Mycobacteria Associated with Extrinsic Contamination of Culture Supplement. Journal of Clinical Microbiology 1997;35:2040-2042.

176. Manangan LP, Perrotta DM, Banerjee SN, Hack D, Simonds D, and Jarvis WR. Status of Tuberculosis Infection Control Programs at Texas Hospitals, 1989 through 1991. American Journal of Infection Control 1997;25:229-235.

177. Kellerman S, Tokars JI, and Jarvis WR. The Cost of Selected Tuberculosis Control Measures at Hospitals with a History of *Mycobacterium tuberculosis* Outbreaks. Infection Control and Hospital Epidemiology 1997;18:542-547.

178. Montecalvo MA, Shay DK, Gedris C, Petrullo C, Uman J, Rodney K, Jarvis WR, and Wormser GP. A Semiquantitative Analysis of the Fecal Flora of Patients with Vancomycin-resistant Enterococci: Colonized Patients Pose an Infection Control Risk. Clinical Infectious Diseases 1997;25:929-930.

179. Sinkowitz RL, Keyserling H, Walker TJ, Holland J, and Jarvis WR. The Epidemiology of Vancomycin Usage at a Children's Hospital, 1993 through 1995.

Journal of Pediatric Infectious Diseases 1997;16:485-489.

180. Wenger PN, Tokars JI, Brennan P, Samel C, Bland L, Miller M, Carson L, Arduino M, Edelstein P, Aguero S, Riddle C, O=Hara C, and Jarvis WR. An Outbreak of *Enterobacter hormaechei* Infection and Colonization in an Intensive Care Nursery. Clinical Infectious Diseases 1997;24:1243-1244.

181. Ihrig M, Cookson ST, Campbell K, Hartstein AI, and Jarvis WR. Evaluation of the Acceptability of a Needleless Vascular-Access System by Nurses. American Journal of Infection Control 1997;25:434-438.

182. Cookson ST, Lopardo H, Marin M, Arduino R, Rial MJ, Altschuler M, Galanternik L, Swenson JM, Tokars JI and Jarvis WR. A Study to Determine the Ability of Clinical Laboratories to Detect Antimicrobial Resistant Enterococcus spp, in Buenos Aires,

Argentina. Diagnostic Microbiology and Infectious Diseases 1997:29:107-110.

183. Kuehnert MJ, Webb RM, Jochimsen EM, Hancock GA, Arduino MJ, Hand S, Currier M, Jarvis WR. *Staphylococcus aureus* Bloodstream Infections Among Patients Undergoing Electroconvulsive Therapy Traced to Breaks in Infection Control and Possible Extrinsic Contamination of Propofol. Anesthesia and Analgesia 1997;85:420-425.

184. Simonds DN, Horan T, Kelley R, and Jarvis WR. Detecting Pediatric Nosocomial Infections: How Do Infection Control and Quality Assurance Personnel Compare? American Journal of Infection Control 1997;25:202-208.

185. Archibald LK, Corl A, Shah B, Schulte M, Arduino M, Aguero S, Fisher DJ, Stechenberg BW, Banerjee SN, and Jarvis WR. *Serratia marcescens* Outbreak Associated with Extrinsic Contamination of 1% Chlorxylenol Soap. Infection Control and Hospital Epidemiology 1997;18:704-709.

186. Tokars JI, Paul SM, Crane GL, Cetron MS, Finelli L, and Jarvis WR. Secular Trends in Bloodstream Infection caused by Antimicrobial-Resistant Bacteria in New Jersey Hospitals, 1991-1995. American Journal of Infection Control 1997;25:395-400.

187. McDonald LC, Kuehnert MJ, Tenover FC, and Jarvis WR. Vancomycin-resistant Enterococci Outside the Health-care Setting: Prevalence, Sources, and Public Health Implications. Emerging Infectious Diseases 1997;3:311-317.

188. McDonald LC and Jarvis WR. The Global Impact of Vancomycin Resistant Enterococci. Current Opinions in Infectious Disease 1997:10:304-309.

189. Archibald LK, Manning ML, Bell LM, Banerjee SN, and Jarvis WR. Patient Density, Nurse-to-Patient Ratio and Nosocomial Infection Risk in a Pediatric Cardiac Intensive Care Unit. Pediatric Infectious Diseases Journal 1997;16:1045-1048.

190. Shay DK, Fann LA, and Jarvis WR. Respiratory Distress and Sudden Death Associated with Receipt of a Peripheral Parenteral Nutrition Admixture. Infection Control and Hospital Epidemiology 1997;18:814-817.

191. Rosenberg J, Tenover FC, Wong J, Jarvis WR, and Vugia D. Are Clinical Laboratories in California Accurately Reporting Vancomycin-Resistant Enterococci? Journal of Clinical Microbiology 1997;35:2526-2530.

192. Cookson ST, Nora JJ, Kithas JA, Arduino MJ, Bond WW, Miller PH, Monahan J, Hoffman RE, Curiel T, Kaufman D, Groves BM, and Jarvis WR. Pyrogenic Reactions in Patients Undergoing Cardiac Catheterization Associated with

Contaminated Glass Medicine Cups. Catheterization and Cardiovascular Diagnosis 1997;42:12-18.

193. Manangan LP, Perrotta DM, Banerjee SN, Hack D, Simonds D, and Jarvis WR. Status of Tuberculosis Infection Control Programs at Texas Hospitals, 1989-1991. American Journal of Infection Control 1997;25:229-235.

194. Cookson ST, Ihrig M, O'Mara E, Hartstein AI, and Jarvis WR. Use of an Estimation Method to Derive an Appropriate Denominator to Calculate Central Venous Catheter-Associate Bloodstream Infection Rates. Infection Control and Hospital Epidemiology 1998;19:28-31.

195. Cookson ST, Ihrig M, O=Mara EM, Denny M, Volk H, Banerjee SN, Hartstein AI, and Jarvis WR. Increased Bloodstream Infection Rates in Surgical Patients Associated with Variation from Recommended Use and Care Following Implementation of a Needleless Access Device. Infection Control and Hospital Epidemiology 1998;19:23-27.

196. Do AN, Fridkin SK, Yechouron AY, Banerjee SN, Killgore GE, Bourgault AM, Jolivet M, and Jarvis WR. Risk Factors For Early Recurrent *Clostridum difficile*-associated Diarrhea. Clinical Infectious Disease 1998;26:954-959.

197. Jochimsen EM, Carmicheal WW, An J, Cardo DM, Cookson ST, Holmes C.E.M,

Antunes MB, Filho DA, Lyra TM, Barreto V, Azevedo S.M.F.O., and Jarvis WR. Liver Failure and Death After Exposure to Microcystins at a Hemodialysis Center in Brazil. New England Journal of Medicine 1998;383:873-878.

198. Cookson ST, Corrales JL, Lotero JO, Regueira M, Binsztein N, Reeves MW, and Jarvis WR. Disco Fever: Epidemic meningicoccal disease in Northeastern Argentina Associated with Disco Patronage. Journal of Infectious Diseases 1998;178:266-270.

199. Trick WE, and Jarvis WR. Epidemiology of Nosocomial Fungal Infection in the 1990s. Ibero Americana Microbiologia 1998;15:2-6.

200. Chang HJ, Miller HL, Watkin N, Arduino MJ, Ashford D, Midgely G, Agero SM, Pinto-Powell R, Von Reyn CF, Edward W, Pruitt R, McNeil MM, and Jarvis WR. An Epidemic of *Malassezia pachydermatis* in Intensive Care Nursery Associated with Colonization of Health Care Worker Pet Dogs. New England Journal of Medicine 1998;338:706-711.

201. Manangan LP, and Jarvis WR. Prevention of Methicillin-Resistant *Staphylococcus aureus* (MRSA), Methicillin-resistant *Staphylococcus epidermidis* (MRSE), and Vancomycin-resistant Enterococci (VRE) Colonization/Infection. Antibiotics for Clinicians 1998; 2:33-38.

202. Reef SE, Lasker BA, Butcher DS, McNeil MM, Pruitt R, Keyserling H, and Jarvis WR. Nonperinatal Nosocomial Transmission of *Candida albicans* in a Neonatal Intensive Care Unit: Prospective Study. Journal of Clinical Microbiology 1998;36:1255-1259.

203. Mangram AJ, Archibald LK, Hupert M, Tokars J, Silver C, Brennan PJ, Arduino M, Peterson S, Parks S, Raymond A, McCullough M, Jones M, Wassetstein A, Kobrin S, and Jarvis WR. Outbreak of Sterile Peritonitis Among Continuous Cycling Peritoneal Dialysis Patients. Kidney International 1998;54:1367-1371.

204. Manangan LP, Simonds DN, Pugliese G, Kroc K, Banerjee SN, Rudnick JR, Steingraber K, and Jarvis WR. Are U.S. Hospitals Making Progress in Implementing Guidelines for Prevention of *Mycobacterium tuberculosis* Transmission? Archives Internal Medicine 1998;158:1440-1444.

205. Al-Rabea AA, Burwen DR, Eldeen MAF, Fontaine RE, Tenover F, and Jarvis WR. *Klebsiella pneumoniae* Bloodstream Infections in Neonates in a Hospital in the Kingdom of Saudi Arabia. Infection Control and Hospital Epidemiology

    1998;19:674-679.

206. Kellerman S, Tokars JI, and Jarvis WR. The Costs of a Health Care Worker Respiratory Protection and Fit-Testing Programs. Infection Control and Hospital Epidemiology 1998;19:629-634.

207. The Working Group on Prevention of Invasive Group A Streptococcal Infections. Prevention of Invasive Group A Streptococcal Disease Among Household Contacts of Case-Patients. Is Prophylaxis Warranted. Journal of the American Medical Association 1998;279:1206-1210.

208. Jarvis WR. Epidemiology, Appropriateness, and Cost of Vancomycin Use. Clinical Infectious Diseases 1998;26:1200-1203.

209. Pfaller MA, Messer SA, Houston A, Rangel-Frausto MS, Wiblin T, Blumberg HM, Edwards JE, Jarvis WR, Martin MA, Neu HC, Saiman L, Patterson JE, Dibb JC, Roldan CM, Rinaldi MG, and Wenzel RP. National Epidemiology of Mycoses Survey: A Multi-center Study of Strain Variation and Antifungal Susceptibility Among Isolates of Candida Species. Diagnostic Microbiology and Infectious Diseases 1998;31:289-296.

210. McDonald LC, Walker M, Carson L, Arduino M, Aguero SM, Gomez P, McNeil P, and Jarvis WR. Outbreak of Acinetobacter Bloodstream Infections in a Nursery Associated with Contaminated Aerosols and Air Conditioners. Pediatric Infectious Diseases Journal 1998;17:716-727.

211. McAllister SK, Pearson ML, Bland LA, Arduino MJ, Aguero SM, Jarvis WR and the Latex Study Group. Comparison of Serologic Immunoassays for the Detecting of Latex-Specific IgE in Sera. Journal of Clinical Ligand Assay 1998;21:335-339.

212. Wenger PN, Brown JM, McNeil MM, and Jarvis WR. *Nocardia farcinica* Sternotomy Site Infections in Patients following Open Heart Surgery. Journal of Infectious Diseases 1998;178:1539-1543.

213. Jochimsen EM, Frenette C, Delorme M, Arduino M, Aguero S, Carson LA, Ismail J, Lapierre S, Czyziw E, Tokars JI, and Jarvis WR. A Cluster of Bloodstream Infections and Pyrogenic Reactions Among Hemodialysis Patients Traced to Dialysis Machine Waste-Handling Option Units. American Journal of Nephrology 1998;18:485-489.

214. Kellerman SE, Simond D, Banerjee SN, Towsley J, Stover B, APIC and Jarvis WR.

    APIC and CDC Survey of *Mycobacterium tuberculosis* Isolation and Control Practices in Hospitals Caring for Children. Part I: Patient and Family Isolation Policies and Procedures. American Journal of Infection Control 1998;26:478-482.

215. Kellerman SE, Simond D, Banerjee SN, Towsley J, Stover B, APIC and Jarvis WR. APIC and CDC Survey of *Mycobacterium tuberculosis* Isolation and Control Practices in Hospitals Caring for Children. Part II: Environmental and Administrative Controls. American Journal of Infection Control 1998;26:483-487.

216. McDonald LC, Banerjee SN, and Jarvis WR. Line-Associated Bloodstream Infections in Pediatric Intensive Care Unit Patients Associated with Needleless Device and Intermittent Intravenous Therapy. Infection Control and Hospital Epidemiology 1998;19:772-777.

217. Kellerman S, Chan J, and Jarvis WR. Use of Urokinase in Pediatric Hematology/Oncology Patients. American Journal of Infection Control 1998;26:502-506.

218. Kuehnert MJ, Clark E, Lockhart SR, Soll DR, Chia J, and Jarvis WR. *Candida albicans* Endocarditis Associated with a Contaminated Aortic Valve Allograft: Implications for Regulation of Allograft Processing. Clinical Infectious Diseases 1998:27;688-691.

219. Cochran RL and Jarvis WR. Antimicrobial Use and Resistance: Solutions to the Problem Satellite Videoconference. Current Issues in Antibiotics 1998;1:2.

220. Toscano CM and Jarvis WR. Epidemiology and Clinical Aspects of Unusual Fungal Nosocomial Infections. Clinical Updates in Fungal Infections 1999;2:1-5.

221. Jason J, Archibald L, McDonald LC, Hart M, Rheanppumikankit S, Tansuphwaswadikul S, Byrd MG, Larned J, Han A, Green TA, and Jarvis WR. Immune Determinants of Organism and Outcome in Febrile Hospitalized Thai Patients with Bloodstream Infections. Clinical and Diagnostic Laboratory Immunology 1999;6:73-78.

222. Smith TL, Pearson ML, Wilcox KR, Cruz C, Lancaster MV, Robinson-Dunn B, Tenover FC, Zervos M, Band JD, White E, Jarvis WR and the Glycopeptide-Intermediate *Staphylococcus aureus* Working Group. Emergence of Vancomycin Resistance in *Staphylococcus aureus*. New England Journal of Medicine 1999;340:493-501.

223. Garrett DO, Jochimsen E, Murfitt K, Hill B, McAllister S, Nelson P, Spera R, Sall R, Tenover FC, Johnston J, Zimmer B and Jarvis WR. The Emergence of Decreased Susceptibility to Vancomycin in *Staphylococcus epidermidis*. Infection Control and Hospital Epidemiology 1999;17:167-170.

224. Jochimsen EM, Fish L, Manning K, Young S, Singer DA, Bacher R, and Jarvis WR. Control of Vancomycin-resistant Enterococci at a Community Hospital: Efficacy of Patients and Staff Cohorting. Infection Control and Hospital Epidemiology 1999;20:106-110.

225. Tokars JI, Sachiko S, Rimland D, Carson L, Miller E, Killum E. Sinkowitz-Cochran R, Arduino M, Tenover F, Marston B, and Jarvis WR. The Prevalence of Colonization with Vancomycin-Resistant Enterococci at a Veteran=s Affairs Institution. Infection Control and Hospital Epidemiology 1999;20:171-175.

226. Garrett DO, Jochimsen E, and Jarvis WR. Invasive Aspergillosis spp. Infection in Rheumatology Patients. The Journal of Rheumatology 1999;26:146-149.

227. Do AN, Ray BJ, Banerjee SN, Illian AF, Barnett B, Pham MH, Hendricks KA, and Jarvis WR. Bloodstream Infections Associated with Needleless Device Use and the Importance of Infection Control Practices in Home Health Care Setting. Journal of Infectious Diseases 1999;179:4442-4448.

228. McDonald LC, Garza LR, and Jarvis WR. Proficiency of Clinical Laboratories in and near Monterrey, Mexico to Detect Vancomycin-Resistant Enterococci. Emerging Infectious Diseases Journal 1999;5:143-146.

229. Archibald LK, Romas M, Arduino MJ, Aguero SM, Deseda C, Banerjee S, and Jarvis WR. *Enterobacter cloacae* and *Pseudomonas aeruginosa* Polymicrobial Bloodstream Infections Traced to Extrinsic Contamination of a Dextrose Multidose Vial. Journal of Pediatrics 1999;133:640-644.

230. Kramer MH, Mangram AJ, Pearson ML, and Jarvis WR. Surgical Site Complications Associated with Morphine Nerve Paste Used for Postoperative Pain Control After Laminectomy. Infection Control and Hospital Epidemiology 1999;20:183-186.

231. Talan DA, Moran GJ, Mower WR, Newdow M, Ong S, Slutsker L, Jarvis WR, Conn LA, and Pinner RW and the Emergency ID NET Study Group. Emergency ID NET: An Emergency Department-Based Emerging Infections Sentinel Network. Clinical Infectious Diseases 1999;28:401-403.

232. Manangan LP, Collazo ER, Tokars J, Paul S, and Jarvis WR. Trends in Compliance With the Guideline for Preventing the Transmission of *Mycobacterium tuberculosis* Among New Jersey Hospitals, 1989 to 1996. Infection Control and Hospital Epidemiology 1999;20:337-341.

233. Mangram AJ, Horan TC, Pearson ML, Silver LC, and Jarvis WR. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. Infection Control and Hospital Epidemiology 1999;20:250-278.

234. Roth VR, and Jarvis WR. Emerging Therapeutic TargetsBCombating Antimicrobial Resistance in Hospitals. Emerging Therapeutic Targets 1999;373-88.

235. Shah SS, Sinkowitz-Cochran, Keyserling H, and Jarvis WR. Vancomycin Use in Pediatric Cardiothoracic Surgery Patients. Pediatric Infectious Disease Journal 1999;18:558-560.

236. Do AN, Limpakarnjarat K, Uthaivoravit W, Zuber P, Korattana S, Binkin N, Mastro TD, and Jarvis WR. Increased Risk of *Mycobacterium tuberculosis* Infection Related to Occupational Exposures of Healthcare Workers in Chiang Rai, Thailand. Journal of the International Union Against Tuberculosis 1999;3:377-381.

237. Burwen DR, Margo C, McNeil M, Brown J, Tapelband G, Jenkins R, and Jarvis WR. A Pseudoepidemic of Postoperative Scleritis Due to Misdiagnosis. Infection Control and Hospital Epidemiology 1999;20:539-542.

238. Dembek Z, Kellerman S, Ganley L, Capacchione C, Tenover F, Cartter M, Kruiningen V, Jarvis WR, and Hadler J. Reporting of Vancomycin-resistant Enterococcus in Connecticut: Implementation and Validation of a State-Based Surveillance System. Infection Control and Hospital Epidemiology 1999;20:671-675.

239. Kuehnert MJ, Jernigan JA, Pullen AL, Rimland D and Jarvis WR. Association Between Mucositis Severity and Vancomycin-resistant Enterococcal Bloodstream Infection in Hospitalized Cancer Patients. Infection Control and Hospital

Epidemiology 1999;20:660-663.

240. Archibald LK, McDonald LC, Rheanpumikankit S, Tansuphaswadikul S, Chaovanich A, Eampokalap B, Banerjee SN, Reller LB, and Jarvis WR. Fever and Human Immunodeficiency Virus Infection as Sentinels for Emerging Mycobacterial and Fungal Bloodstream Infections in Hospitalized Patients ≤15 years Old, Bangkok. Journal of Infectious Diseases 1999;180:87-92.

241. Shah SS, Sinkowitz-Cochran, Keyserling H, and Jarvis WR. Vancomycin Use in Pediatric Neurosurgery Patients. American Journal of Infection Control 1999;27:482-497.

242. Mangram AJ, Horan TC, Pearson ML, Silver LC, and Jarvis WR. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. American Journal of Infection Control 1999;27:97-132.

243. Trick WE, Kuehnert MJ, Quirk SB, Arduino MJ, Aguero SM, Carson LA, Hill BC, Banerjee SN, and Jarvis WR. Regional Dissemination of Vancomycin-resistant Enterococci Resulting from Inter-facility Transfer of Colonized Patients. Journal of Infectious Diseases 1999;180:391-396.

244. Smith T and Jarvis WR. Understanding Antimicrobial Resistance in *Staphylococcus aureus*. Microbes and Infection 1999;1:795-805.

245. McDonald LC, Archibald LK, Rheanpumikankit S, Tansuphaswadikul S, Eampokalap B, Kazembe P, Dobbie H, Nwanyanwu O, Reller LB, and Jarvis WR. Unrecognized *Mycobacterium tuberculosis* Bloodstream Infections Among Hospitalized Patients in the Developing World. Lancet 1999;354:1159-1163.

246. Manangan LP, Archibald LK, Pearson ML, Duffy RE, Garrett DO, Alonso-Echanove J, Richet HM, Parvez FM, and Jarvis WR. Selected Global Healthcare Activities of the Hospital Infections Program, Centers for Disease Control and Prevention. American Journal of Infection Control 1999;27:270-274.

247. McDonald LC, Banerjee S, Jarvis WR, and The NNIS System. Seasonal Variation of *Acinetobacter* spp. Infections, 1987-1996. Clinical Infectious Diseases 1999;29:1133-1137.

248. Alonso-Echanove Juan, Robles B, Jarvis WR, and the Spanish VRE Study Group. Proficiency of Clinical Laboratories in Spain in Detecting Vancomycin−resistant Enterococcus spp. Journal of Clinical Microbiology 1999;37:2148-2152.

249. Montecalvo MA, Jarvis WR, Unan J, Shay DK, Petrullo C, Rodney K, Gedris C,

Horowitz H, and Wormser GP. Infection-Control Measures Reduce Transmission of Vancomycin-resistant Enterococcus in an Endemic Setting. Annals of Internal Medicine 1999;131:269-272.

250. Rangel-Frausto MS, Wiblin T, Blumberg HM, Saiman L, Patterson J, Rinaldi M, Pfaller M, Edwards JE Jr., Jarvis W, Dawson J, Wenzel RP, and the NEMIS Study Group. National Epidemiology of Mycosis Survey (NEMIS): Variations in Rates of Bloodstream Infections Due to *Candida* Species in Seven Surgical Intensive Care Units and Six Neonatal Intensive Care Units. Clinical Infectious Diseases 1999:29:253-258.

251. Marco F, Lockhart SR, Pfaller MA, Pujol C, Rangel-Frausto MS, Wiblin T, Blumberg HM, Edwards JE Jr, Jarvis WR, Saiman L, Patterson JE, Rinaldi MG, Wenzel RP, The NEMIS Study Group, and Soll DR. Elucidating the Origins of Nosocomial Infections with *Candida albicans* by DNA Fingerprinting with the Complex Probe Ca3. Journal of Clinical Microbiology 1999; 37:2817-2828.

252. Richards C and Jarvis W. Lessons From Recent Nosocomial Epidemics. Current Opinions in Infectious Diseases 1999;12:327-334.

253. Toscano CM and Jarvis WR. Emerging Issues in Nosocomial Fungal Infections. Current Infectious Disease Reports 1999;1:347-361.

254. McNeil MM, Lasker BA, Lott TJ, and Jarvis WR. Post-surgical *Candida albicans* Infections Associated with an Extrinsically Contaminated Intravenous Anesthetic Agent. Journal of Clinical Microbiology 1999;37:1398-1403.

255. Brendenberg HR, Manangan LP, and Jarvis. Selected Hospital Infections Program Outbreak Investigations Over the Past Five Years. Infection Control Today 1999;3:26-30.

256. Kellerman S, Saiman L, Soto-Irizarry M, San Gabrial P, Larsen CA, Besser R, Catzanero A, and Jarvis WR. Costs Associated with Tuberculosis Control Programs at Hospitals Caring for Children. Pediatric Infectious Diseases Journal 1999;18:604-608.

257. Tokars JI, Cookson ST, McArthur MA, Boyer CL, McGreer AJ, and Jarvis WR. Prospective Evaluation of Risk Factors for Bloodstream Infection in Patients Receiving Home Infusion Therapy. Annals of Internal Medicine 1999;131:340-347.

259. Labarca JA, Trick WE, Peterson CL, Carson LA, Holt SC, Arduino MJ, Mascola L, and Jarvis WR. A Multistate Nosocomial Outbreak of *Ralstonia pickettii*

Colonization Associated with an Intrinsically Contaminated Respiratory Care Solution. Clinical Infectious Diseases 1999;29:1281-1286.

260. Wang SA, Levin RB, Carson LA, Arduino MJ, Killar T, Grillo FG, Pearson ML, and Jarvis WR. An Outbreak of Gram-Negative Bacteremia in Hemodialysis Patients Traced to Hemodialysis Machine Waste Drain Ports. Infection Control and Hospital Epidemiology 1999;20:746-751.

261. Chen IL, Eckhardt JN, Sinkowitz-Cochran RL, and Jarvis WR. Satellite Videoconferencing for Healthcare Workers: Audience Characteristics and the Importance of Continuing Education Credits. Infection Control and Hospital Epidemiology 1999;20:778-780.

262. Labarca JA, McDonald LC, Pinto ME, Palavecino E, Gonzalez P, Cona E, Fernandez A, Giglio MS, and Jarvis WR. Proficiency in Detecting Vancomycin Resistance in Enterococci Among Clinical Laboratories in Santiago, Chile. Emerging Infectious Diseases Journal 1999;5:839-840.

263. Smith TL and Jarvis WR. Antimicrobial Resistance in *Staphylococcus aureus*. Microbes and Infection 1999:1;795-805.

263. Granich R, Binkin NJ, Jarvis WR, Simone PM, Rieder HL, Espinal MA, and Kumaresan J. Guidelines for the Prevention of Transmission of *Mycobacterium tuberculosis* in Health Care Facilities in Resource-Limited Settings. World Health Organization (WHO/TB/99.269), 1999.

264. Trick WE, Scheckler WE, Tokars JI, Jones KC, Smith EM, Reppen ML, and Jarvis WR. Modifiable Risk Factors Associated with Coronary Artery Bypass Graft Deep Sternal Site Infection. Journal of Thoracic and Cardiovascular Surgery 2000;49:108-114.

265. El-Sayed NM, Gomatos PJ, Beck-Sague CM, Dietrich U, VonBriesen H, Osmanor S, Espana J, Arthur RR, Wahdan MH, and Jarvis WR. Epidemic Transmission of Human Immunodeficiency Virus in Hemodialysis Centers in Egypt. Journal of Infectious Diseases 2000:181;91-98.

267. Robert J, Fridkin SK, Blumberg HM, Anderson B, White N, Ray SM, Chan J, and Jarvis WR. The Influence of the Composition of the Nurse to Staffing Ratio on Primary Bloodstream Infection Rates in a Surgical Intensive Care Unit. Infection Control and Hospital Epidemiology 2000:21;12-18.

268. Saimon L, Ludington E, Pfaller M, Rangel-Frausto S, Wiblin RT, Dawson J,

Blumberg HM, Patterson JE, Rinaldi M, Edwards JE, Martin MA, Wenzel RP, and Jarvis WR. Risk Factors for Candidemia in Neonatal Intensive Care Unit Patients. The National Epidemiology of Mycosis Survey Study Group. Pediatric Infectious Diseases Journal 2000:19;319-324.

269. Roth VR and Jarvis, WR. Outbreaks of Infection and/or Pyrogenic Reactions in Dialysis Patients. Seminars in Dialysis 2000:13;92-96.

270. Archibald LK, McDonald LC, Nwanyanwu O, Kazembe P, Dobbie H, Tokars J, Reller, B, and Jarvis, WR. A Hospital-based Prevalence Survey of Bloodstream Infections in Febrile Patients in Malawi: Implications for Diagnosis and Therapy. Journal of Infectious Diseases 2000:181;1414-1420.

271. Duffy R, Tomashek K, Spangenberg M, Spry L, Dwyer D, Safranek, TJ, Ying C, Portesi D, Divan H, Kobrenski J, Arduino M, Tokars J, and Jarvis WR. Multi-state Outbreak of Hemolysis in Hemodialysis Patients Traced to Faulty Blood Tubing Sets. Kidney International 2000:57;1668-1674.

271. Hutter JC, Kuehnert MJ, Wallis RR, Lucas AD, Sen S, and Jarvis WR. Acute Onset of Decreased Vision and Blindness Traced to Hemodialysis Treatment with Aged Dialyers. Journal of the American Medical Association 2000:283;2128-2134.

272. Kim SD, McDonald LC, Miller JM, McAllister SK, Jerris R, Carson LA, and Jarvis WR. Determining the Significance of Coagulase-negative Staphylococci from Blood Cultures at a Community Hospital: A Role for Species and Strain Identification. Infection Control and Hospital Epidemiology 2000:21;213-217.

273. Manangan LP, Banerjee SN and Jarvis WR. Association Between Implementation of CDC Recommendations and Ventilator-Associated Pneumonia at Selected U.S. Hospitals. American Journal of Infection Control 2000;28:222-227.

274. Trick WE, Kioski CM, Howard KM, Cage GD, Tokars JL, Ben BM, and Jarvis WR. Outbreak of *Pseudomonas aeruginosa* Ventriculitis Among Patients in a Neurosurgical Intensive Care Unit. Infection Control and Hospital Epidemiology

2000:21;204-208.

275. Trick WE, Scheckler WE, Tokars JL, Jones KC, Smith EM, Reppen ML, and Jarvis WR. Risk Factors for Radial Artery Harvest Site Infection Following Coronary Artery Bypass Graft Surgery. Journal of Thoracic and Cardiovascular Surgery 2000:49;108-114.

276. Moolenaar RL, Crutcher JM, San Joaquin VH, Sewell LV, Hutwagner LC, Carson LA, Robison DA, Smithee LM, and Jarvis WR. A Prolonged Outbreak of *Pseudomonas aeruginosa* in a Neonatal Intensive Care Unit: Did Staff Fingernails

Play a Role in Disease Transmission? Infection Control and Hospital Epidemiology 2000:21;80-85.

277. Manangan LP, Bennett CL, Tablan N, Simonds DN, Pugliese G, Collazo E, and Jarvis WR. Nosocomial Tuberculosis Prevention Measures Among Two Groups of U.S. Hospitals, 1992 to 1996. Chest 2000:117;380-384.

278. Wang SA, Tokars JI, Bianchine PJ, Carson LA, Arduino MJ, Smith AL, Hansen NC, Fitzgerald EA, Epstein JS, and Jarvis WR. *Enterobacter cloacae* Bloodstream Infections Traced to Intrinsically Contaminated Human Albumin. Clinical Infectious Diseases 2000:30;35-40.

279. Hopkins HA, Sinkowitz-Cochran RL, Rudin BA, Keyserling HL, and Jarvis WR. Vancomycin Use in Pediatric Hematology-Oncology Patients. Infection Control and Hospital Epidemiology 2000:21;48-50.

280. Alexander LN and Jarvis WR. Surveillance and Control of Surgical Site Infections. AORN Surgical Services Management, March 2000.

281. Archibald LK, McDonald LC, Addison RM, McKnight C, Byrne T, Dobbie H, Nwanyanwu O, Kazembe P, Reller LB, and Jarvis WR. Comparison of the BACTEC MYCO/F LYTIC and WAMPOLE ISOLATOR 10 (Lysis-Centrifugation) Systems for Detection of Bacteremia, Mycobacteremia, and Fungemia in a Developing Country. Journal of Clinical Microbiology 2000;38:2994-2997.

282. Beltrami EM, Singer DA, Fish L, Manning K, Young S, Banerjee SN, Baker R and Jarvis WR. Risk Factors for Acquisition of Vancomycin-resistant Enterococci Among
Patients on a Renal Ward During a Community Hospital Outbreak. American Journal of Infection Control 2000;28:282-285.

283. Manangan LP, Jarvis WR. Preventing multidrug-resistant tuberculosis and errors in tuberculosis treatment around the globe. Chest. 2000;117:620-3.

284. Sinkowitz RL, Cazes C, Chinn RY, Vargo J, and Jarvis WR. When Clusters Occur: Illustrative Example and Statistical Dilemma. American Journal of Infection Control 2000;28:325-326.

285. Duffy RE, Brown SE, Caldwell KL, Lubniewski A, Anderson N, Edelhauser H, Holley G, Tess A, Divan H, Helmy M, Arduino M, Jarvis WR, and the Toxic Endothelial Cell Destruction Syndrome Investigative Team. Toxic Endothelial Cell Destruction of the Cornea Following Intra-ocular Surgery Associated with Trace Element Contamination of Instruments Sterilized by Plasma Gas. Archives of Ophthalmology 2000;118:1167-1176.

286. Sohn AH, Sinkowitz-Cochran RL, and Jarvis WR. Program Overview: The Reality Check Sessions at the 4th Decennial International Conference on Nosocomial and Healthcare-Associated Infections. Infection Control and Hospital Epidemiology 2000;21:742-744.

287. Roth VR, Murphy C, Perl TM, DeMaria A, Sohn AH, Sinkowitz-Cochran RL, and Jarvis WR. Should We Routinely Use Mupirocin to Prevent Staphylococcal Infections? Infection Control and Hospital Epidemiology 2000;21:745-750.

288. Sinkowitz-Cochran RL, Stein GP, Keyserling HL, Levine GL, Jarvis WR, the Pediatric Prevention Network. The Internet: A Practical Example of the Use New Technology in the Assessment of Vancomycin Use in Pediatrics. American Journal of
Infection Control 2000;28:459-464.

289. Sinkowitz-Cochran RL and Jarvis WR. Evaluation of a Satellite Education Program on the Prevention and Control of Antimicrobial Resistance. American Journal of Infection Control 2000;28:392-400.

290. Nguyen GT, Proctor SE, Sinkowitz-Cochran RL, Garrett DO, Jarvis WR, and APIC. Status of Infection Surveillance and Control Programs in the United States, 1992-1996. American Journal of Infection Control 2000;28:392-400.

291. Buchholz U, Richards C, Murthy R, Arduino M, Pon D, Schwartz W, Fontanilla E, Pegues C, Boghossian N, Peterson C, Kool J, Mascola L and Jarvis WR. Pyrogenic Reactions Associated with Single Daily Dosing of Intravenous Gentamicin. Infection Control and Hospital Epidemiology 2000;21:771-774.

292. Coignard B, Siegel JD, Weinstein RA, Sohn AH, Sinkowitz-Cochran RL, and Jarvis WR. How Should We Control Antimicrobial Use?: Current Practices and Controversies. Infection Control and Hospital Epidemiology 2000;21:792-795.

293. Roth VR, Arduino MA, Novelletti J, Holt SC, Carson LA, Wolf CFW, Leves BA, Allison PM and Jarvis WR. Transfusion-Related Sepsis Due to *Serratia liquifaciens* in the United States. Transfusion 2000;40:931-935.

294. Sternfield IE, Divan HA, Manangan LP, Pearson ML, Richet HM, and Jarvis WR. Investigating Outbreaks in Healthcare Settings. Infection Control Today 2000;2:43-44.

295. Robles Garcia MB, Diaz Arguello JJ, Rey Galan C, Orejas Rodriquez-Atango G, and Jarvis WR. Factores De Riesgo De Bacteriemia Nosocomial Segum La Naturaleza De La Infection En La Unidad De Cuidados Intensivos Neonatal Es El Estrafilococcus Coagulasa Negatvo Un Contaminante O Un Pathogeno? Hospital

Grady Memorial, Atlanta, EE.UU. Rev Esp Pediatrics 2000;56:387-394.

296. Jason J, Buchanan I, Archibald L, Nwanyanwu OC, Bell M, Eick A, Han A, Razsi D, Kazembe PN, Dobbie H, Midathada M, and Jarvis WR. Natural T and Natural Killer Cells in Mycobacterial, Salmonella, and HIV Infection. Journal of Infectious Diseases 2000;182:474-481.

297. Ostrowsky B, Steinberg JT, Farr B, Sohn AH, Sinkowitz-Cochran RL, and Jarvis WR. Should We Try to Detect and Isolate VRE-Colonized/Infected Patients? Infection Control and Hospital Epidemiology 2001;22:116-120.

298. Burwen DR, Lasker BA, Rao N, Durry E, Padhye AA, and Jarvis WR. Invasive Aspergillosis Outbreak on a Hematology-Oncology Ward. Infection Control and Hospital Epidemiology 2001;22:45-48.

299. Alvarado F, Alter MJ, Bower W, Henderson DK, Sohn AH, Sinkowitz-Cochran RL, and Jarvis WR. Management of Occupational Exposures to HCV: Current Practices and Controversies. Infection Control and Hospital Epidemiology 2001;22:53-55.

300. Grohskopf LA, Maki DG, Sohn AH, Sinkowitz-Cochran RL, Jarvis WR, and Goldmann DA. Should We Use Vancomycin for the Prophylaxis of Intravascular Catheter-Associated Infections? Infection Control and Hospital Epidemiology 2001;22:176-179.

301. Sohn AH, Ostrowsky BE, Sinkowitz-Cochran RL, Quirk SB, and Jarvis WR. Evaluation of a Successful Vancomycin-resistant Enterococcus Prevention Intervention in a Community of Healthcare Facilities. American Journal of Infection Control 2001;29:53-57.

302. Trick WE, Weinstein RA, DeMarais PL, Kuehnert MJ, Tomaska W, Nathan C, Rice T, McAllister SK, Carson LA, Jones KC, and Jarvis WR. Colonization of Skilled Care Facility Residents with Antimicrobial-Resistant Pathogens. Journal of American Geriatrics Society 2001;49:270-276.

303. Jarvis WR. Infection Control and Changing Health-Care Delivery Systems. Emerging Infectious Diseases 2001;7:170-173

304. Richet HM, Mohammed J, McDonald LC, and Jarvis WR. Building Communication Networks: International Network for the Study and Prevention of Emerging Antimicrobial Resistance. Emerging Infectious Diseases 2001;7:319-322.

305. Manning ML, Archibald LK, Bell LM, Banerjee SN, and Jarvis WR. *Serratia marcescens* Transmission in a Pediatric Cardiac Intensive Care Unit: A Multifactorial Occurrence. American Journal of Infection Control 2001;29:115-119.

306. Manangan LP, Pugliese G, Lynch P, Jackson M, Sohn AH, Sinkowitz-Cochran RL, and Jarvis WR. Infection Control Dogma - Top Ten Suspects. Infection Control and Hospital Epidemiology 2001;22:243-247.

307. Kellerman SE, Saiman L, San Gabriel P, Besser R, and Jarvis WR. Observational Study of the Use of Infection Control Interventions for *Mycobacterium tuberculosis* in Pediatric Facilities. Pediatric Infectious Diseases Journal 2001;20:566-570.

308. Blumberg HM, Jarvis WR, Soucie JM, Edwards JE Jr, Patterson JE, Pfaller MA, Rangel-Frausto MS, Rinaldi MG, Saiman L, Wiblin RT, Wenzel RP, and the NEMIS Study Group. Risk Factors for Candida Bloodstream Infections in Surgical Intensive Care Unit Patients: the NEMIS Prospective Multicenter Study. Clinical Infectious Diseases 2001;33:177-187.

309. Alonso-Echanove J, Granich R, Laxlo A, Chu R, Borja N, Farfan R, Olortegui A, Lorenzo M, Binkin NJ, and Jarvis WR. Occupational Transmission of *Mycobacterium tuberculosis* to Health Care Workers in a University Hospital in Lima, Peru. Clinical Infectious Diseases 2001;33:589-596.

310. Grohskopf LA, Roth VR, Feikin DR, Arduino MJ, Carson LA, Tokars JI, Holt SC, Hoffman RE, and Jarvis WR. *Serratia liquefaciens* Bloodstream Infections From Contamination of Epoetin Alfa at a Hemodialysis Center. New England Journal of Medicine 2001;344:1491-1497.

311. Ostrowsky BE, Trick WE, Sohn A, Quirk SB, Holt S, Carson LA, Hill BC, Arduino MJ, Kuehnert M, and Jarvis WR. Control of Vancomycin-Resistant Enterococcus Colonization in Healthcare Facilities In A Region. New England Journal of Medicine 2001;344:1427-1433.

312. Pearson ML, Levine WC, Finton RJ, Ingram CT, Gay KB, Tapelband G, Smith JD, and Jarvis WR. Anesthesia-associated Carbon Monoxide Exposures Among Surgical Patients. Infection Control and Hospital Epidemiology 2001;22:352-356.

313. Stover BH, Shulman ST, Bratcher D, Brady MT, Levine GL, Jarvis WR, and the Pediatric Prevention Network. Nosocomial Infection Rates in U.S. Children's Hospitals' Neonatal and Pediatric Intensive Care Units. American Journal of Infection Control 2001;29:152-157.

314. Girouard S, Levine G, Goodrich K, Jones S, Keyserling H, Rathore M, Rubens C, Williams E, and Jarvis WR. Infection Control Programs at Children=s Hospitals: A Description of Structures and Processes. American Journal of Infection Control 2001;29:145-151.

315. Girouard S, Levine G, Goodrich K, Jones S, Keyserling H, Rathore M, Rubens C, Williams E, Jarvis WR and the Pediatric Prevention Network. Pediatric Prevention Network: A Multi-center Collaboration to Improve Health Care Outcomes. American Journal of Infection Control 2001;29:158-161.

316. Jason J, Archibald LK, Nwanyanwu OC, Bell M, Buchanan I, Larned J, Kazembe PN, Dobbie H, Parekh B, Byrd MG, Eick A, Han A, Razsi D, and Jarvis WR. Cytokine and Malaria Parasitemia. Clinical Immunology 2001;100:208-218.

317. Lew E, Gallagher L, Kuehnert M, Rimland D, Hubbard M, Parekh B, Zell E, Jarvis W, and Jason J. Intracellular Cytokines in the Acute Response to Highly Active Antiretroviral Therapy. AIDS 2001;15:1665-1670.

318. Alonso-Echanove J, Sha SS, Velanti AJ, Dirrigl SN, Carson LA, Arduino M, and Jarvis WR. Nosocomial Outbreak of *Microbacterium* spp. Bacteremia Among Cancer Patients. Journal of Infectious Diseases 2001;184:754-760.

319. Bell M, Archibald L, Nwanyanwu O, Dobbie H, Tokars J, Kazembe P, Reller LB, and Jarvis WR. Seasonal Variation in the Etiology of Bloodstream Infections in a Febrile Inpatient Population in a developing Country. International Journal of Infectious Diseases 2001;5:63-69.

320. Montecalvo MA, Jarvis WR, Uman J, Shay DK, Petrullo C, Horowtiz HW, and Wormser GP. Costs and Savings Associated with Infection Control Measures That Reduced Transmission of Vancomycin-resistant Enterococci in an Endemic Setting. Infection Control and Hospital Epidemiology 2001;22:437-442.

321. Tokars JI, McKinney GF, Otten J, Woodley C, Sordillo EM, Caldwell J, Liss CM, Gilligan ME, Diem L, Onorato I, and Jarvis WR. Use and Efficacy of Tuberculosis Infection Control Practices at Hospitals with Previous Outbreaks of Multidrug-Resistant Tuberculosis. Infection Control and Hospital Epidemiology 2001;22:449-455.

322. Robles Garcia MB, Diaz Arguello JJ, Jarvis WR, Orejas Rodriquez-Arango G, and Rey Galan C. Risk Factors Associated With Nosocomial Bacteremia in Low Birth Weight Neonates, Grady Memorial Hospital, Atlanta. Gaceta Sanitaria 2001;15:111-117.

323. Brown TT, Proctor SE, Sinkowitz-Cochran RL, Smith TL, Jarvis WR, and the Society for Healthcare Epidemiology of America, Inc. Physician Preferences for Continuing Medical Education With a Focus on the Topic of Antimicrobial Resistance: Society for Healthcare Epidemiology of America. Infection Control and Hospital Epidemiology 2001;22:656-660.

324. DeGentile A, Rivas N, Sinkowitz-Cochran RL, Momesso T, Iriart EM, Lopez E,

Beck-Sague CM and Jarvis WR. Nosocomial Infections in a Children's Hospital in Argentina: Impact of a Unique Infection Control Intervention Program. Infection Control and Hospital Epidemiology 2001;22:762-766.

325. Roth VR, Kuehnert MJ, Haley NR, Gregory KR, Schreiber GB, Arduino MJ, Holt SC, Carson LA, Elder KV, and Jarvis WR. Evaluation of a Reporting System for Bacterial Contamination of Blood Components in the United States (The BaCON Study). Transfusion 2001;41:1486-1492.

326. Saiman L, Ludington E, Dawson J, Patterson JE, Rangel-Frausto S, Wiblin RT, Blumberg HM, Pfaller M, Rinaldi M, Edwards JE, Wenzel RP, Jarvis WR, and the National Epidemiology of Mycoses Study Group. Risk Factors for Candida Species

Colonization of Neonatal Intensive Care Unit Patients. Pediatric Infectious Diseases Journal 2001;20:1119-1124.

327. Sohn AH, Garrett DO, Sinkowitz-Cochran RL, Grohskopf LA, Levine GL, Stover BH, Siegel JD, Jarvis WR, and the Pediatric Prevention Network. Prevalence of Nosocomial Infections in Neonatal Intensive Care Unit Patients: Results from the First National Point Prevalence Survey. Journal of Pediatrics 2001;139:821-827.

328. Kuehnert MJ, Roth VR, Haley NR, Gregory KR, Elder KV, Schreiber GB, Arduino MJ, Holt SC, Carson LA, Banerjee SN, and Jarvis, WR. Transfusion-Transmitted Bacterial Infection in the United States, 1998 through 2000. Transfusion 2001;41:1493-1499.

329. Tokars JI, Gehr T, Jarvis WR, Anderson J, Armistead N, Miller ER, Parrish J, Qaiyumi S, Arduino MA, Holt SC, Tenover FC, Westbrook G, and Light P. Vancomycin-resistant Enterococci Colonization in Patients at Seven Hemodialysis Centers. Kidney International 2001;60:1511-1516.

330. Jason J, Archibald LK, Nwanyanwu OC, Bell M, Jensen RJ, Genter E, Buchanan I, Larned J, Kazembe PN, Dobbie H, and Jarvis WR. The Effects of Iron Deficiency on Lymphocyte Cytokine Production and Activation: Preservation of Hepatic Iron but Not at All Cost. Clinical and Experimental Immunology 2001;126:466-473.

331. Jason J, Archibald LK, Nwanyanwu OC, Byrd MG, Kazembe PN, Dobbie H, and Jarvis WR. Comparison of Serum and Cell-Specific Cytokines in Humans. Clinical and Diagnostic Laboratory Immunology 2001;8:1097-1103.

332. Sullivan KM, Dykewitz CA, Longworth DL, Boeckh M, Baden LR, Rubin RH, Sepkowitz KA, the Centers for Disease Control and Prevention (WR Jarvis), Infectious Diseases Society of America, American Society for Blood and Marrow Transplantation Practice Guidelines and Beyond. Hematology 2001;3:392-421.

333. Harbath S, Levine GL, Jarvis WR, Goldmann DA, Huskins WC, and the Pediatric Prevention Network. Computerized Pharmacy Databases as a Source of Data on Antimicrobial Prescriptions in Children's Hospitals. American Journal of Health-Systems Pharmacy 2001;58:2069-2071.

334. Archibald LK, Dobbie H, Kazembe P, Nwanyanku O, McKnight C, Byrne T, Addison RM, Bell M, Reller LB, and Jarvis WR. Utility of Paired BACTEC MYCO/F LYTIC Blood Culture Vials for the Detection of Bacteremia, Mycobacteremia, and

Fungemia. Journal of Clinical Microbiology 2001;39:1960-1962.

335. Jason JM, Archibald LK, Nwanyanwu OC, Sowell AL, Buchanan I, Larned J, Bell M, Kazembe PN, Dobbie H, and Jarvis WR. Vitamin A Levels and Immunity in Humans. Clinical and Diagnostic Laboratory Immunology 2002;9:616-621.

336. Ostrowsky BE, Whitener C, Brendenberg KH, Carson LA, Holt S, Hutwagner L, Arduino MJ, and Jarvis WR. *Serratia marcescens* Bacteremia Traced to an Infused Narcotic. New England Journal of Medicine 2002;346:1529-1537.

337. Grohskopf LA, Sinkowitz-Cochran RL, Garrett DO, Sohn AH, Levine GL, Siegel JD, Stover BH, Jarvis WR, and the Pediatric Prevention Network. A National Point-Prevalence Survey of Pediatric Intensive Care Unit-Acquired Infections in the United States. Journal of Pediatrics 2002;140:432-438.

338. Pettiford JN, Jason JM, Nwanyanwu OC, Archibald LK, Kazembe PN, Dobbie H and Jarvis WR. Age-Related Differences in Cell-Specific Cytokine Production by Acutely Ill Malawian Patients. Clinical and Experimental Immunology 2002;128:110-117.

339. Garrett DO, McDonald LC, Wandeley A, Wanderley C, Miller P, Carr J, Arduino M, Sehulster L, Anderson RA, and Jarvis WR. An Outbreak of Neonatal Deaths in Brazil Associated with Contaminated Intravenous Fluids. Journal of Infectious Diseases 2002;186:81-86.

340. Reller LB, Archihbald LK, Jarvis WR, and Grohskopf LA. Disseminated Infection with Simiae-Avium Group Mycobacteria in Persons with AIDS, Thailand and Malawi, 1997. Journal of the American Medical Association 2002;288:157-158.

341. Sohn AH, Parvez FM, Vu T, Hai HH, Bich NN, Le Thu TA, Le Hoa T, Thanh NH, Viet TV, Archibald LK, Banerjee SN, and Jarvis WR. Prevalence of Surgical Site Infections and Patterns of Antimicrobial Use in a Large Tertiary-Care Hospital in Ho Chi Minh City, Vietnam. Infection Control and Hospital Epidemiology 2002;23:382-387

342. Walker D, Jason J, Wallace K, Slaughter J, Whatley V, Han A, Nwanyanwu OC, Kazembe PN, Dobbie H, Archiblad L, and Jarvis WR. Spontaneous Cytokine Production and Its Effect on Induced Production. Clinical and Diagnostic Laboratory Immunology 2002;9:1049-1056.

343. Pessoa da Silva CL, Toscano CM, Moreira BM, Santos AL, Frota AC, Solari CA, Amorim EL, Carvalho MGS, Teixeira LM, and Jarvis WR. Extended-Spectrum Beta-Lactamase Producing *Salmonella enterica* ss. Enterica Serotype Infantis in a Neonatal Unit. Journal of Pediatrics 2002;141:381-387.

344. Smith TL, Pullen GT, Crouse V, Rosenberg J, and Jarvis WR. Bloodstream Infections in Pediatric Outpatient Oncology PatientsBA New Healthcare Systems Challenge. Infection Control and Hospital Epidemiology 2002;23:381-387.

345. Rubin LG, Sanchez PJ, Siegel JD, Levine GL, Saiman L, Jarvis WR, and the Pediatric Prevention Network. Evaluation and Treatment of Neonates With Suspected Late-onset Sepsis (LOS): A Survey of Neonatologists' Practices. Pediatrics 2002;110:2002.

346. Guideline for Hand Hygiene in Health-care Settings. Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force (including William R. Jarvis). Morbidity and Mortality Report. 2002;51:No. RR-16 (1-45).

347. Jason J, Archibald LK, Nwanyanwu OC, Kazembe PN, Chatt JA, Norton E, Dobbie H, and Jarvis WR. Clinical and Immune Impact of *Mycobacterium bovis* BCG Vaccination Scarring. Infection and Immunity 2002;70:6188-6195.

348. Archibald LK, Nwanyanwu O, Kazembe PN, Mwaisambo C, Bell M, Dobbie H, Reller LB, and Jarvis WR. Detection of Bloodstream Pathogens in a Bacille Calmette-Guerin (BCG)-Vaccinated Paediatric Population in Malawi: a pilot study. Clinical Microbiology and Infection 2002;8:1-5.

349. Walsh NM, Casano AA, Manangan LP, Tablan OC, Sinkowitz-Cochran RL, and Jarvis WR. Risk Factors for *Burkholderia cepacia* complex Colonization and Infection Among Patients with Cystic Fibrosis. Journal of Pediatrics 2002;141:512-517.

350. Manangan LP, Pearson ML, Tokars JI, Miller E, and Jarvis WR. Feasibility of National Surveillance of Health-Care-Associated Infections in Home-Care Settings. Emerging Infectious Diseases Journal 2002;8:233-236.

351. Chatt JA, Jason JM, Nwanyanwu OC, Archibald LK, Bharat P, Kazembe PN, Dobbie H, and Jarvis WR. Peripheral Blood Cell-Specific Cytokines in Persons with

Untreated HIV Infection in Malawi, Africa. AIDS Research and Human Retroviruses 2002;18:1367-1377.

352. DeSantis SM, Pau CP, Archibald LK, Nwanyanwu OC, Kazembe PN, Dobbie H, Jarvis WR, and Jason JM. Demographic and Immune Correlates of HHV-8 Seropositivity in Malawi, Africa. International Journal of Infectious Diseases 2002;6:266-271.

353. Boyce JM, Pittet D and the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force (includes WR Jarvis). Guideline for Hand Hygiene in Health-care Settings. American Journal of Infection Control 2002;30:S1-S46.

354. Reller LB, Archibald LK, Jarvis WR, Grohskopf LA. From the Centers for Disease Control and Prevention. Disseminated infection with Simiae-avium group mycobacteria in persons with AIDS--Thailand and Malawi, 1997. JAMA. 2002;288:157, 157-8.

355. Fridkin SK, Hageman J, McDougal LK, Mohammed J, Jarvis WR, Perl T, Tenover FC, and the Vancomycin-Intermediate *Staphylococcus aureus* Epidemiology Study Group. Epidemiological and Microbiological Characterization of Infections Caused by *Staphylococcus aureus* With Reduced Susceptibility to Vancomycin, United States, 1997-2001. Clinical Infectious Diseases 2003;36:429-439.

356. Jernigan JA, Pullen AL, Partin C, and Jarvis WR. Prevalence of and Risk Factors For Colonization with Methicillin-resisant *Staphylococcus aureus* in an Outpatient Clinic Population. Infection Control and Hospital Epidemiology 2003;24:445-450.

357. Jernigan JA, Pullen A, Flowers L, Bell M, and Jarvis WR. Prevalence of and Risk Factors for Colonization with Methicillin-Resistant *Staphylococcus aureus* at the Time of Hospital Admission. Infection Control and Hospital Epidemiology 2003;24:409-414.

358. Richet HM, Benbachir M, Brown D, Giamarellou H, Gould I, Gubina M, Heczko P, Kalenic S, Pana M, Pittet D, Redjeb SB, Schindler J, Starling C, Struelens M, Witte W, Jarvis WR, and the International Network for the Study and Prevention of Emerging Antimicrobial Resistance (INSPEAR). Are There Regional Variations in the Diagnosis, Surveillance, and Control of Methicillin-Resistant *Staphylococcus aureus*? Infection Control and Hospital Epidemiology 2003;24:334-342.

359. Muto CA, Jernigan JA, Ostrowsky BE, Richet HM, Jarvis, WR, Boyce JM, and Farr BM. SHEA Guideline for Preventing Nosocomial Transmission of Multidrug-

Resistant Strains of *Staphylococcus aureus* and Enterococcus. Infection Control and Hospital Epidemiology 2003;24:362-386.

360. Saiman L, Siegel J and the Cystic Fibrosis Foundation Consensus Conference on Infection Control Participants (including W.R. Jarvis). Infection Control Recommendations for Patients with Cystic Fibrosis: Microbiology, Important Pathogens, and Infection Control Practices to Prevent Patient-to-Patient transmission. Infection Control and Hospital 2003;24:SS1-45.

361. Saiman L, Siegel J and the Cystic Fibrosis Foundation Consensus Conference on Infection Control Participants (including W.R. Jarvis). Infection Control Recommendations for Patients with Cystic Fibrosis: Microbiology, Important Pathogens, and Infection Control Practices to Prevent Patient-to-Patient transmission. American Journal of Infection Control 2003;31:SS1-62.

362. Douglas B. Nelson, MD, William R. Jarvis, MD, William A. Rutala, PhD, Amy E. Foxx-Orenstein, DO, Gerald Isenberg, MD, Georgia P. Dash, RN, MS, Carla J. Alvarado, MS, Marilee Ball, RN, Joyce Griffin-Sobel, RN, PhD, Carol Petersen, RN, Kay A. Ball, RN, Jerry Henderson, and Rachel L. Stricof, MPH. Multi-society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes. Infection Control and Hospital Epidemiology 2003;24:532-538.

363. Douglas B. Nelson, MD, William R. Jarvis, MD, William A. Rutala, PhD, Amy E. Foxx-Orenstein, DO, Gerald Isenberg, MD, Georgia P. Dash, RN, MS, Carla J. Alvarado, MS, Marilee Ball, RN, Joyce Griffin-Sobel, RN, PhD, Carol Petersen, RN, Kay A. Ball, RN, Jerry Henderson, and Rachel L. Stricof, MPH. Multi-society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes. Gastrointestinal Endoscopy 2003;58:1-8.

364. Duffy RE, Couto B, Pessoa JM, Starling C, Pinheiro L, Pearson ML, Arduino MJ, Mattson BJ, Tokars JI, and Jarvis WR. Improving Water Quality Can Reduce Pyrogenic Reactions Associated With Reuse of Cardiac Catheters. Infection Control and Hospital Epidemiolgy 2003;24:955-960.

365. Karras DJ, Ong S, Moran GJ, Nakase J, Kuehnert MJ, Jarvis WR, Talan DA, and the EMERGEncy ID Net Study Group. Antibiotic Use for Emergency Department Patients with Acute Diarrhea: Prescribing Practices, Patient Expectations, and Patient Satisfaction. Annals of Emergency Medicine 2003;42:835-842.

366. Keyserling HL, Sinkowitz-Cochran RL, Harris Jm, Levine GL, Siegel JD, Stover BH, Lau SA, Jarvis WR and the Pediatric Prevention Network. Vancomycin Use in Hospitalized Pediatric Patients. Pediatrics 2003;112:e104-111.

367. Archibald LK, Kazembe PN, Nwanyanwu O, Mwaisambo C, Reller LB, and Jarvis WR. Epidemiology of Bloodstream Infections in a Bacille Calmette-Guerin (BCG)-

vaccinated Padiatric Population in Malawi: Journal of Infectious Diseases 2003;188:202-208.

368. Jarvis WR. Benchmarking for Prevention: The Centers for Disease Control and Preventionôs National Nosocomial Infections Surveillance (NNIS) System Experience. Infection 2003;31:44-48.

369. Jernigan JA, Pullen AL, Partin C, and Jarvis WR. Prevalence of and Risk Factors for Colonization with Methicillin-resistant *Staphylococcus aureus* in an Outpatient Clinic Population. Infection Control and Hospital Epidemiology 2003;24:44-450.

370. Jernigan JA, Pullen AL, Flowers L, Bell M, and Jarvis WR. Prevalence of and Risk Factors for Colonization with Methicillin-resistant Staphylococcus aureus at the Time of Hospital Admission. Infection Control and Hospital Epidemiology 2003;24:409-414.

371. Keyserling HL, Sinkowitz-Cochran RL, Harris JM, Levine GL, Siegel JD, Stover BH, Lau SA, Jarvis WR and the Pediatric Prevention Network. Vancomycin Use in Hospitalized Pediatric Patients. Pediatrics 2003;112:e104-e111.

372. Kainer MA, Linden JV, Whaley DN, Holmes HT, Jarvis WR, Jernigan DB, and Archibald LK. Clostridium Infections: Associated with Musculoskeletal-Tissue Allografts. New England Journal of Medicine 2004; 350:2564-2571.

373. Trick WE, Weinstein RA, DeMarais PI, Tomaska W, Nathan C, McAllister SK, Hageman J, Rice TW, Westbrook G, and Jarvis WR. Comparison of Routine Glove Use to Contact Isolation Precautions to Prevent Transmission of Multidrug-Resistant Bacteria in a Long-Term Care Facility. Journal of the American Geriatric Society 2004;52:2003-2009.

374. Jackson M, Jarvis WR, and Scheckler WE. HICPAC/SHEAð Conflicting Guidelines: What is the Standard of Care. American Journal of Infection Control 2004;32:504-511.

375. Nelson DB, Jarvis WR, Rutala WA, Foxx-Orenstein AE, Isenberg G, Dash G, Alvarado CJ, Ball M, Griffin-Sobel J, Peterson C, Ball KA, Henderson J, Stricof RL, and SHEA. Multi-Society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes. Diseases of the Colon and Rectum 2004;47:413-420.

376. Jarvis WR. The State of the Science of Healthcare Epidemiology, Infection Control, and Patient Safety, 2004. American Journal of Infection Control. 2004;32:496-503.

377. Bryant K, Stover B, Cain L, Levine GL, Siegel J, and Jarvis, WR. Improving Influenza Immunization Rates Among Healthcare Workers Caring for High Risk

Pediatric Patients. Infection Control and Hospital Epidemiology 2004;25:912-917.

378. Rosenberg J, Jarvis WR, Reingold A, and Vugia D. Emergence of Vancomycin-resistant Enterococci (VRE) in San Francisco Bay Area Hospitals, 1994-1998. Infection Control and Hospital Epidemiology 2004;25:408-412.

379. Archibald LK, Tuohy MJ, Wilson DA, Nwanyanwu O, Kazembe PN, Tansuphasawadikul S, Eampokalap B, Chaovavanich A, Reller LB, Jarvis WR, Hall GS, and Procop GW. Antifungal Susceptibility of *Cryptococcus neoformans*. Emerging Infectious Diseases 2004;10:143-145.

380. Richards C, Alonso-Echanove J, Caicedo Y, and Jarvis WR. *Klebsiella pneumoniae* Bloodstream Infections in a High-Risk Nursery in Cali, Columbia. Infection Control and Hospital Epidemiology 2004;25:221-225.

381. Norton E, Archibald LK, Nwanyanwu OC, Kazembe PN, Dobbie H, Reller LB, Jarvis WR, and Jason J. Clinical Predictors of Bloodstream Infections and Mortality in Hospitalized Malawian Children. Pediatric Infectious Diseases Journal 2004;23:145-151.

382. Grohskopf LA, Huskins WC, Sinkowitz-Cochran RL, Levine GL, Goldmann DA, Jarvis WR, and the Pediatric Prevention Network. Use of Antimicrobial Agents in United States Neonatal and Pediatric Intensive Care Unit Patients. Pediatric Infectious Diseases Journal 2005;9:766-773.

383. Levy MZ, Medeiros EA, Shang N, Soares MC, Homenko AS, Almeida RM, Garrett DO, Roth VR, Jarvis WR, Wells CD, Binkin N, and Lazerson KF. TST Reversion in a BCG-revaccinated Population of Nursing and Medical Students, Sao Paulo Brazil, 1997-2000. International Journal of Tubercular Lung Disease 2005;7:771-776.

384. Moore KL, Kainer MA, Badrawi N, Afifi S, Wasfy M, Bashir M, Jarvis WR, Graham TW, el-Kholy A, Gipson R, Jernigan DB, and Mahoney F. Neonatal Sepsis in Egypt Associated with Bacterial Contamination of Glucose-Containing Intravenous Fluids. Pediatric Infectious Diseases 2005;7:590-594.

385. Kainer MA, Keshavarz H, Jensen BJ, Arduino MJ, Brandt ME, Padhye AA, Jarvis WR, and Archibald L. Saline-Filled Breast Implant Contamination with Curvularia Species Among Women Who Underwent Cosmetic Breast Augmentation. Journal of Infectious Diseases 2005;192:170-177.

386. Roth VR, Garrett DO, Laserson KF, Starling CE, Kritski AL, Medeiros EA, Binkin N, Jarvis WR. A multicenter evaluation of tuberculin skin test positivity and conversion among health care workers in Brazilian hospitals. Int J Tuberc Lung Dis. 2005;9:1335-42.

387. Blakely JT, Sinkowitz-Cochran RL, Jarvis WR. Infectious diseases physicians' preferences for continuing medical education on antimicrobial resistance and other general topics. Infect Control Hosp Epidemiol. 2006;27:873-5.

388. Banerjee SN, Grohskopf LA, Sinkowitz-Cochran RL, Jarvis WR; National Nosocomial Infections Surveillance System; Pediatric Prevention Network. Incidence of pediatric and neonatal intensive care unit-acquired infections. Infect Control Hosp Epidemiol. 2006;27:561-70.

389. Archibald LK, Khoi NN, Jarvis WR, Reller LB, Cam PD, Thu TA, Hung NV. Pyrogenic reactions in hemodialysis patients, Hanoi, Vietnam. Infect Control Hosp Epidemiol. 2006;27:424-6.

390. Alonso-Echanove J, Sippy BD, Chin AE, Cairns L, Haley R, Epstein JS, Richards MJ, Edelhauser H, Hedberg K, Kuehnert MJ, Jarvis WR, Pearson ML, and the Transfusion-Associated Red Eye Syndrome Study Group. Nationwide Outbreak of Red Eye Syndrome Associated with Transfusion of Leukocyte-reduced Red Blood Cells. Infect Control Hosp Epidemiol. 2006;27:1146-52.

391. Cortazal M, Soule BM, Jarvis WR. The Prevalence of *Staphylococcus aureus*. Am J Infect Control. 2006;34:613-5.

392. Le TA, Dibley MJ, Vo VN, Archibald L, Jarvis WR, Sohn AH. Reduction in Surgical Site Infections in Neurosurgical Patients Associated with a Bedside Hand Hygiene Program in Vietnam. Infect Control Hosp Epidemiol. 2007;28:583-8.

393. Jarvis WR. The Lowbury Lecture. The United States Approach to Strategies in the Battle Against Healthcare-associated Infection, 2006: Transitioning From Benchmarking to Zero Tolerance and Clinician Accountability. J Hosp Infect. 2007;65 Suppl 2:3-9.

394. Jarvis WR, Schlosser J, Chinn RY, Tweeten S, Jackson M. National Prevalence of Methicillin-resistant *Staphylococcus aureus* in Inpatients at U.S. Health Care Facilities, 2006. Am J Infect Control. 2007;35:631-7.

395. Amarante JM, Toscano CM, Pearson ML, Roth V, Jarvis WR, Levin AS. Reprocessing and Reuse of Single-use Medical Devices Used During Hemodynamic Procedures in Brazil: A Widespread and Largely Overlooked Problem. Infect Control Hosp Epidemiol. 2008;29:854-8.

396. Moran GJ, Barrett TW, Mower WR, Krishnadasan A, Abrahamian FM, Ong S, Nakase JY, Pinner RW, Kuehnert MJ, Jarvis WR, Talan DA; EMERGEncy ID NET Study Group. Decision Instrument for the Isolation of Pneumonia Patients With Suspected Pulmonary Tuberculosis Admitted Through U.S. Emergency Departments.

Ann Emerg Med. 2009;53:625-32.

397. Jarvis WR, Schlosser J, Jarvis AA, Chinn RY. National Point Prevalence of *Clostridium difficile* in U.S. Health Care Facility Inpatients, 2008. Am J Infect Control. 2009;37:263-70.

398. Toscano CM, Bell M, Zukerman C, Shelton W, Novicki TJ, Nichols WG, Corey L, Jarvis WR. Gram-negative Bloodstream Infections in Hematopoietic Stem Cell Transplant Patients: The Roles of Needleless Device Use, Bathing Practices, and Catheter Care. Am J Infect Control. 2009;37:327-34.

399. Lanini S, Jarvis WR, Nicastri E, Privitera G, Gesu G, Marchetti F, Giuliani L, Piselli P, Puro V, Nisii C, Ippolito G; INF-NOS Study Group (Gruppo Italiano per lo Studio delle Infezioni Noscomiali). Healthcare-associated Infection in Italy: Annual Point Prevalence Surveys, 2002-2004. Infect Control Hosp Epidemiol. 2009;30:659-65.

400. Jeffries HE, Mason W, Brewer M, Oakes KL, Muñoz EI, Gornick W, Flowers LD, Mullen JE, Gilliam CH, Fustar S, Thurm CW, Logsdon T, Jarvis WR. Prevention of Central Venous Catheter-associated Bloodstream Infections in Pediatric Intensive Care Units: A Performance Improvement Collaborative. Infect Control Hosp Epidemiol. 2009;30:645-51.

402. Jarvis WR, Murphy C, Hall KK, Fogle PJ, Karchmer TB, Harrington G, Salgado C, Giannetta ET, Cameron C, Sherertz RJ. Health Care-associated Bloodstream Infections Associated with Negative or Positive-pressure or Displacement Mechanical Valve Needleless Connectors. Clin Infect Dis. 2009;49:1821-7.

403. Sohn AH, Schwartz JM, Yang KY, Jarvis WR, Guglielmo BJ, Weintrub PS. Risk Factors and Risk Adjustment for Surgical Site Infections in Pediatric Cardiothoracic Surgery Patients. Am J Infect Control. 2010;38:706-10.

404. Towns ML, Jarvis WR, Hsueh PR. Guidelines on Blood Cultures. J Microbiol Immunol Infect. 2010;43:347-9.

405. Rosenthal VD, Lynch P, Jarvis WR, Khader IA, Richtmann R, Jaballah NB, Aygun C, Villamil-Gómez W, Dueñas L, Atencio-Espinoza T, Navoa-Ng JA, Pawar M, Sobreyra-Oropeza M, Barkat A, Mejía N, Yuet-Meng C, Apisarnthanarak A; International Nosocomial Infection Control Consortium members. Socioeconomic Impact on Device-associated Infections in Limited-resource Neonatal Intensive Care Units: Findings of the INICC. Infection. 2011;39:439-50.

406. Archibald LK, Jarvis WR. Health Care-associated Infection Outbreak Investigations by the Centers for Disease Control and Prevention, 1946-2005. Am J Epidemiol. 2011;174(11 Suppl):S47-64.

406. Ye X, Rupnow M, Bastide P, Lafuma A, Ovington L, Jarvis WR. Economic Impact of Use of Chlorhexidine-impregnated Sponge Dressing for Prevention of Central-line Associated Infections in the United States. Am J Infect Control. 2011;39:647-54.

407. Edmonds SL, Macinga DR, Mays-Suko P, Duley C, Rutter J, Jarvis WR, Arbogast JW. Comparative Efficacy of Comercially Available Alcohol-based Hand Rubs and World Health Organization-recommended Hand Rubs: Formulation Matters. Am J Infect Control 2012;40:521-5.

408. Jarvis WR, Jarvis AA, Chinn RY. National Prevalence of Methicillin-resistant *Staphylococcus aureus* in Inpatients at United States Health Care Facilities, 2010. Am J Infect Control. 2012;40:194-200.

409. Jarvis WR. What can Canada learn from the USA's experience in reducing healthcare-associated infections? Clinical Governance 2012;17:149-154.

410. Rosenthal VD, Jarvis WR, Jamulitrat S, Silva CP, Ramachandran B, Dueñas L, Gurskis V, Ersoz G, Novales MG, Khader IA, Ammar K, Guzmán NB, Navoa-Ng JA, Seliem ZS, Espinoza TA, Meng CY, Jayatilleke K; International Nosocomial Infection Control Members. Socioeconomic Impact on Device-associated Infections in Pediatric Intensive Care Units of 16 Limited-resource Countries: International Nosocomial Infection Control Consortium Findings. Pediatr Crit Care Med. 2012;13:399-406.

411. Chernecky CC, Waller JL, Jarvis WR. In Vitro Study Assessing the Antibacterial Activity of Three Silver-impregnated/Coated Mechanical Valve Needleless Connectors After Blood Exposure. Am J Infect Control. 2013;41:278-80.

412. DalBen MF, Basso M, Garcia CP, Costa SF, Toscano CM, Jarvis WR, Lobo RD, Oliveira MS, Levin AS. Colonization Pressure as a Risk Factor for Colonization by Multi-resistant Acinetobacter spp. and Carbapenem-resistant Pseudomonas aeruginosa in an Intensive Care Unit. Clinics (Sao Paulo). 2013;68:1128-33.

413. Bell, S., Benneyan, J., Best, A., Birnbaum, D., Borycki, E.M., Gallagher, T.H., Goeschel, C., Jarvis, B., Kushniruk, A.W., Mazor, K.M., Pronovost, P. and Sheps, S. Mandatory Public Reporting: Build It and Who Will Come? Stud Health Technol Inform 2011;164:346-52.

414. Lederer JW, Jarvis WR, Thomas L, Ritter J. Multicenter Cohort Study to Assess the Impact of a Silver-alloy and Hydrogel-coated Urinary Catheter on Symptomatic Catheter-associated Urinary Tract Infections. J Wound Ostomy Continence Nurs. 2014;41:473-80.

415. Tabak YP, Jarvis WR, Sun X, Crosby CT, Johannes RS. Meta-analysis on Central Line-associated Bloodstream Infections Associated with a Needleless Intravenous Connector with a New Engineering Design. Am J Infect Control. 2014;42:1278-84.

416. Arbogast JW, Moore-Schiltz L, Jarvis WR, Harpster-Hagen A, Hughes J, Parker A. Impact of a Comprehensive Workplace Hand Hygiene Program on Employer Health Care Insurance Claims and Costs, Absenteeism, and Employer Perceptions and Practices. J Occup Environ Med. 2016;58:e231-40.

417. Tabak YP, Johannes RS, Sun X, Crosby CT, and Jarvis WR. Innovative Use of Existing Public and Private Data Sources for Post-marketing Surveillance of Central Line-Associated Bloodstream Infections Associated with Intravenous Needleless Connectors. J Infus Nurs. 2016;39:328-35.

Book Chapters

1. James M. Hughes and William R. Jarvis. Epidemiology of Nosocomial Infections In Section II: Nosocomial Infection Prevention and Control, pp 99105. Manual on Clinical Microbiology, Fourth Edition. American Society for Microbiology. Washington, DC, 1985.

2. James M. Hughes and William R. Jarvis. Nosocomial Gastroenteritis. In Prevention and Control of Nosocomial Infections. Richard Wenzel, M.D., Editor. Williams and Wilkins, Baltimore, Maryland, 1986.

3. Anita K. Highsmith and William R. Jarvis. Endotoxin Production as a Virulence Factor in Disease. In: Detection of Bacterial Endotoxins with the Limulus Amebocyte Lysate Test. Alan R. Liss, Inc., 1987, pp 387343.

4. Report of the Committee on Infectious Diseases. American Academy of Pediatrics. G. Peter, Editor. Elk Grove, Illinois, 1986.

5. Margaret Tipple, William J Martone, William R. Jarvis. Nosocomial Bacteremia and Fungemia. In: Nosocomial Infections in the Pediatric Patient. Donowitz E, Editor. Williams and Wilkins, Baltimore, Maryland, 1988, pp 116.

6. Larry Anderson, Stephen Hadler, Carlos Lopez, Susan FisherHoch, William R. Jarvis, Walter W. Bond, and Daniel Fishbein. Nosocomial Viral Infections. In: The Laboratory Diagnosis of Infectious Diseases: Vol II Viral, Rickettsial and Chlamydial Diseases. Lennette EH., Halonen P, Murphy FA, Editors. New York: Springer Verlag 1988.

7. Allen JR and Jarvis WR. Nosocomial Infections in Neonates. Merck Manual. 1990.

8. Beck-Sague CM and Jarvis WR. The Epidemiology and Prevention of Nosocomial Infections. In Disinfection, Sterilization and Preservation, S. S. Block. Editor. 1990, pages 663-675.

9. Villarino ME, BeckSague CM, and Jarvis WR. AIDS, Infection Control and Employee Health: Considerations in Rehabilitative Medicine. In Rehabilitation for Patients with HIV Disease. Ed. John Mukand, Editor. McGrawHill, Inc, 1991.

10. Report of the Committee on Infectious Diseases. Red Book 1990. American Academy of Pediatrics. G. Peter, Editor. Elk Grove, Illinois, 1990.

11. Martone WJ, Jarvis WR, Culver DH, and Haley RW. Endemic and Epidemic Nosocomial Infections. In Hospital Infections. P. Brachman and JV Bennett, Editor, Little, Brown and Co, 1992.

12. Villarino ME, Vega D, HargrateBean N, Hughes JM, and Jarvis WR. The Role of Food Services in Nosocomial Infection. In Hospital Infections. P. Brachman and J.V. Bennett, Editor, Little, Brown and Co, 1992.

13. Beck-Sague CM, Banerjee SN, and Jarvis WR. Epidemiology and Control of *Pseudomonas aeruginosa* in U.S. Hospitals. In *Pseudomonas aeruginosa* Infections and Treatment, AL Baltch and RP Smith, Editors. Marcel Dekker, Inc, 1994.

14. Maloney SM and Jarvis WR. Epidemic Nosocomial Pneumonia in the Intensive Care Unit. In Clinics in Chest Medicine, - Pneumonia in the Intensive Care Unit, R. Wunderink, Editor. W.B. Saunders Company, 1995.

15. Welbel SF and Jarvis WR. Nosocomial Viral Infections in the Critically Ill. In Infection and Sepsis in Intensive Care. HKF Van Saene M.D., Editor. Oxford University Press.

16. Zaza S and Jarvis WR. Investigation of Outbreaks. In Hospital Epidemiology and Infection Control. C. Glen Mayhall, Editor. Williams and Wilkins, 1995.

l7. Snider D, Dooley S, and Jarvis WR. *Mycobacterium tuberculosis*. In Hospital Epidemiology and Infection Control. C. Glen Mayhall, Editor, Williams and Wilkins, 1995.

18. Shay D, Goldmann D, and Jarvis WR. Reducing the Spread of Antimicrobial-Resistant Microorganisms: Control of Vancomycin-resistant Enterococci, Pediatric Clinics of North America. Volume 42, P 703-717, June 1995 Williams and Wilkins Co, Baltimore, MD.

19. Zaza S and Jarvis WR. Investigations in Health Care Facilities. pp 208-227. In Field Epidemiology. M.B. Gregg, Editor. Oxford University Press, New York 1996.

20. Beck-Sague CM, Jarvis WR, and Martone WJ. Outbreak Investigation. In Manual on Hospital Epidemiology, L. Herwaldt, Editor. William and Wilkins, 1995.

21. Do A, and Jarvis WR. Transfusion-Related Infection, pp 340-343. In Current therapy of Infectious Disease. D. Schlossberg, M.D. Editor, Mosby-Yearbook, Inc. 1996.

22. Jarvis WR. Nosocomial *Mycobacterium tuberculosis* Outbreaks: Risk Factors, Preventive Intervention Efficacy, and Guidelines. In Mycobacteria, Volume 1. Basic Aspects. p 210-234 1997, P.R.J. Gangadharam and P.A. Jenkins Editors. Chapman and Hall, New York, New York.

23. Martone WJ, Jarvis WR, Culver DH, and Haley RW. Endemic and Epidemic Nosocomial Infections. In Hospital Infections. P Brachman and JV Bennett, Editor, Little, Brown and Co, 1996.

24. Slutsker L, Goulding J, Villarino M, Jarvis WR, and Griffin PM. Foodborne Disease Prevention in Health Care Facilities. In Hospital Infections. P Brachman and JV Bennett, Editor, Little, Brown and Co, 1996.

25. Shay DK and Jarvis WR. Clinical Syndromes Associated with Hospitalization. In Principles and Practices of Pediatric Infectious Diseases. S Long, L Pickering and C Prober Editors, Churchill Publishing, 1996.

26. Chang T and Jarvis WR. Epidemiology and Control of Infectious Diseases in Health Care Facilities. In Clinical Infectious Diseases, A Practical Approach. PP 61-80. R. Root, F. Waldvogel, L. Corey, and W. Stamm, Editors, Churchill Publishing, 1996.

27. Jarvis WR and Robles B. Nosocomial Infections in Pediatric-Patients. Advances in Pediatric Infectious Diseases. Volume 12, pp 243-295, S. Aronoff, W. Hughes, S. Kohl, and E. Wald, Editors, Mosby-Year Book, Inc., 1997, St. Louis, MO.

28. Cookson ST, Hughes JM, and Jarvis WR. Nosocomial Gastrointestinal Infection. In Wenzel RP, ed. Prevention and Control of Nosocomial Infections, 3rd Edition. Williams and Wilkins, Baltimore, Maryland, 1997.

29. Cookson ST and Jarvis WR. Prevention of Nosocomial Transmission of *Mycobacterium tuberculosis*. Infectious Diseases Clinics of North America 1997;11:385-409.

30. Jarvis WR. Outbreaks Associated with Reprocessed Medical Devices: The Hospital Infections Program, Centers for Disease Control and Prevention Experience, January 1986 - April 1996. In Disinfection Sterilization and Antisepsis in Health Care. Rutala WA, Editor, APIC, Washington, DC and Polyscience Publications, Inc, Champlain, NY, 1998.

31. Jarvis WR. Issues and Controversies in the Prevention and Control of Vancomycin-resistant Enterococci (VRE). Edited by G Pugliese and RA Weinstein. ETNA Communications, Chicago, Illinois, 1998.

32. Parvez F and Jarvis WR. Nosocomial Infections in the Nursery. Seminars in Pediatric Infectious Disease. 1999;10:119-129.

33. Roth V and Jarvis WR. Transfusion-Related Infection. Pages 412-415. In Current Therapy of Infectious Diseases. Second Edition. D. Schlossberg, M.D., Editor. Mosby-Yearbook, Inc., 2001.

34. Richards C and Jarvis WR. Investigating Nosocomial Outbreaks. Recent Advances in Infectious Diseases. 1999.

35. Richards C and Jarvis WR. Administrative, Engineering, and Personnel Protective Devices For Controlling the Transmission of *Mycobacterium tuberculosis*. Resurgent and Emerging Infectious Diseases Series. Multidrug-Resistant Tuberculosis, Edited by Ivan Bastian and Francoise Portaels. Kluwer Academic Publishers, Norwell, Massachusetts, 2000.

36. Report of the Committee on Infectious Diseases. Red Book 2000. 25th Edition. American Academy of Pediatrics. G. Peter, Editor. Elk Grove, Illinois, 2000.

37. Archibald L and Jarvis WR. Epidemiological Principles and the Microbiology Laboratory. In Pharmaceutical Microbiology. A New and Integrated Approach, Edited by Richard Prince, Ph.D. Serentec Press, Raleigh, North Carolina, 2000.

38. Sinkowitz-Cochran RL and Jarvis WR. The Epidemiology and Prevention of Nosocomial Infections. In Disinfection, Sterilization and Preservation, 5th Edition, Edited by S.S. Block, Ph.D., Lippincott, Williams, and Williams, 2000.

39. Jarvis WR and Zaza S. Investigations in Health Care Facilities. In Field Epidemiology. MB Gregg, Editor. Oxford University Press, New York 2001.

40. Sohn A, Shay DK and Jarvis WR. Clinical Syndromes Associated with Hospitalization. In Principles and Practices of Pediatric Infectious Diseases. S. Long, L. Pickering and C. Prober, Editors, Churchill Publishing, 2001.

41. Grohskopf L, Fisher M, and Jarvis W. Clinical Syndromes of Device-Related Infections. In Principles and Practices of Pediatric Infectious Diseases. S. Long, L. Pickering and C. Prober, Editors, Churchill Publishing, 2001.

42. Sinkowitz-Cochran R and Jarvis WR. Epidemiologic Approach to Outbreak Investigations. In Seminars in Infection Control. DJ Weber and WA Rutula, eds. W.B. Saunders Co., Philadelphia, PA.

43. Sohn AH and Jarvis, WR. Benchmarking in Pediatric Infection Control: Results from the National Nosocomial Infections Surveillance (NNIS) System and the Pediatric Prevention Network. Seminars in Pediatric Infectious Diseases 2001;12:254-266.

44. Jarvis WR. Hospital Infections Program, Centers for Disease Control and Prevention On-site Outbreak Investigations, 1990-1999. In Seminars in Infection Control. DJ Weber and WA Rutala, eds. W.B. Saunders Co., Philadelphia, PA.

45. Sinkowitz-Cochran R and Jarvis WR. Epidemiologic Approach to Investigating an Outbreak. In Seminars in Infection Control. DJ Weber and WA Rutala, eds. W.B. Saunders Co., Philadelphia, PA.

46. Archibald L and Jarvis WR. The Role of the Laboratory in Outbreak Investigations, with an Emphasis on Molecular Typing. In Seminars in Infection Control. DJ Weber and WA Rutala, eds. W.B. Saunders Co., Philadelphia, PA.

47. Manangan L and Jarvis WR. Psuedo-outbreaks. In Seminars in Infection Control. DJ Weber and WA Rutala, eds. W.B. Saunders Co., Philadelphia, PA.

48. Grohskopf L and Jarvis WR. Outbreaks Associated with Medical Devices and Medications. In Seminars in Infection Control. DJ Weber and WA Rutala, eds. W.B. Saunders Co., Philadelphia, PA.

49. Kainer M and Jarvis WR. Outbreaks Associated with the Environment. In Seminars in Infection Control. DJ Weber and WA Rutala, eds. W.B. Saunders Co., Philadelphia, PA.

50. Richards CL Jr. and Jarvis WR. Infectious Disease Outbreaks in Long-Term Care Facilities. In Infections and Infection Control in Long-term Care Facilities. Eds Thomas T. Yoshikawa and Joseph G. Ouslander. W.B. Saunders Co., Philadelphia, PA.

51. Jarvis WR. Investigation of Outbreaks. In Hospital Epidemiology and Infection Control. C. Glen Mayhall, Editor. Williams and Wilkins 2004.

52. Moore K, Dooley S, and Jarvis WR. *Mycobacterium tuberculosis*. In Hospital Epidemiology and Infection Control. C. Glen Mayhall, Editor, Williams and Wilkins 2004.

53. Ostrowsky B and Jarvis W. Efficient Management of Outbreak Investigations. Prevention and Control of Nosocomial Infections, 4th Edition. 2003. R.P. Wenzel, editor. Williams and Wilkins, Baltimore, MD.

54. Jarvis WR. Controlling Healthcare-Associated Infections: The Role of Infection Control and Antimicrobial Use Practices. 2004;15:30-40. In Seminars in Pediatric Infectious Diseases. Antimicrobial Resistance. ed, S. Dowell. January 2004. WB Saunders Company , Philadelphia, Pennsylvania.

55. Beck-Sague CM and Jarvis WR. Outbreak Investigation. In Manual on Hospital Epidemiology, K Weiltje, Editor. William and Wilkins, 2004.

56. William R. Jarvis. Investigating Endemic and Epidemic Healthcare-associated Infections. In Hospital Infections, W Jarvis, Editor. Wolters Kluwer Health/Lippincott Williams & Williams, Philadelphia, Pennsylvania, 2007.

57. William R. Jarvis. The Role of the Laboratory in Control of Healthcare-associated Infections. In Hospital Infections, W Jarvis, Editor. Wolters Kluwer Health/Lippincott Williams & Williams, Philadelphia, Pennsylvania, 2007.

58. William R. Jarvis. The Inanimate Environment. In Hospital Infections, W Jarvis, Editor. Wolters Kluwer Health/Lippincott Williams & Williams, Philadelphia, Pennsylvania, 2007.

59. Margarita E. Villinarino and William R. Jarvis. Foodborne Disease Prevention in Healthcare Facilities. In Hospital Infections, W Jarvis, Editor. Wolters Kluwer Health/Lippincott Williams & Williams, Philadelphia, Pennsylvania, 2007.

60. Lennox K. Archibald and William R. Jarvis. Incidence and Nature of Endemic and Epidemic Healthcare-associated Infections. In Hospital Infections, W Jarvis, Editor. Wolters Kluwer Health/Lippincott Williams & Williams, Philadelphia, Pennsylvania, 2007.

61. William R. Jarvis. Tuberculosis. In Hospital Infections, W Jarvis, Editor. Wolters Kluwer Health/Lippincott Williams & Williams, Philadelphia, Pennsylvania, 2007.

62. Arjun Srinivasan and William R. Jarvis. Outbreak Investigations. In Practical Healthcare Epidemiology, 3rd Edition, The University of Chicago Press, 2010.

63. Jarvis WR. Investigation of Outbreaks. In Hospital Epidemiology and Infection Control. C. Glen Mayhall, Editor. Williams and Wilkins (2011).

64. Jarvis WR. *Mycobacterium tuberculosis*. In Hospital Epidemiology and Infection Control. C. Glen Mayhall, Editor, Williams and Wilkins (2011).

65. Jarvis WR and Roth V. Transfusion-Related Infection. Pages 412-415. In Current Therapy of Infectious Diseases. Second Edition. D. Schlossberg, M.D., Editor. Mosby-Yearbook, Inc., 2014.

Books Edited

1. Nosocomial Pneumonia, Edited by William R. Jarvis, M.D. In the Lung Biology in Health and Disease Series, Volume 150, Marcel Dekker, Inc., New York, New York. August 2000.

2. Hospital Infections, 5th Edition. William R. Jarvis, M.D., Editor, Wolters Kluwer Health/Lippincott Williams & Williams, Philadelphia, Pennsylvania, 2007.

3. Economics and Preventing Healthcare-Acquired Infection. Nicholas Graves, Kate Halton and William Jarvis, Editors. Springer Science & Business Media, LLC, New York, New York.

4. Hospital Infections, 6th Edition. William R. Jarvis, M.D., Editor, Wolters Kluwer Health/Lippincott Williams & Williams, Philadelphia, Pennsylvania, 2013.

Editorials

1. William R. Jarvis and Roger A. Feldman. *Clostridium difficile* and Gastroenteritis: How Strong is the Association in Children? Pediatric Infectious Disease 1984;3:46.

2. William R. Jarvis. *Yersinia enterocolitica* -- A New or Unrecognized Nosocomial Pathogen. Infection Control and Hospital Epidemiology 1991;13:137-138.

3. Dooley SW, Jarvis WR, Martone WJ and Snider DE. Multidrug-resistant Tuberculosis. Annals of Internal Medicine 1992;117:257-258.

4. William R. Jarvis. Handwashing, the Semmelweis Lesson Forgotten? Lancet 1994;344:1311-1312.

5. Jarvis WR, Cookson ST, and Robles B. Prevention of Nosocomial Bloodstream Infections: A National and International Priority. Infection Control and Hospital Epidemiology 1996;17:272-275.

6. Mangram A. and Jarvis WR. Nosocomial *Burkholderia cepacia* Outbreaks and Pseudo-Outbreaks. Infection Control and Hospital Epidemiology 1996;17:718-720.

7. Garrett DO, and Jarvis WR. The Expanding Role of Healthcare Epidemiology-Home and Long-term Care. Infection Control and Hospital Epidemiology 1996;17:714-717.

8. Kuehnert MJ and Jarvis WR. Changing Epidemiology of Nosocomial Infections in Human Immunodeficiency Virus-Infected Patients. Clinical Infectious Diseases

1997;25:321-323.

2. Pearson ML, Jarvis WR, Folks TM, and Chapman LE. Xenotransplantation: Is the Future Upon Us? Infection Control and Hospital Epidemiology 1998;19:305-307.

3. McDonald LC and Jarvis WR. Linking Antimicrobial Use to Nosocomial Infections. The Role of a Combined Laboratory-Epidemiology Approach. Annals of Internal Medicine 1998;129:245-247.

4. Manangan LP and Jarvis WR. Preventing Multidrug-resistant Tuberculosis and Errors in Tuberculosis Treatment Around the Globe. Chest 2000;117:620-623.

5. Farr BF and Jarvis WR. Would Active Surveillance Cultures Help Control Healthcare Related Methicillin-Resistant *Staphylococcus aureus* Infection? Infection Control and Hospital Epidemiology 2002;23:65-68.

6. Jarvis WR. The Evolving World of Healthcare-Associated Bloodstream Infection Surveillance and Prevention: Is Your System As Good As You Think? Infection Control and Hospital Epidemiology 2002;23:236-238.

7. Jarvis WR and Ostrowsky B. Dinosaurs, Methicillin-Resistant *Staphylococcus aureus,* and Infection Control Personnel: Survival Through Translating Science Into Prevention. Infection Control and Hospital Epidemiology 2003;24:392-396.

8. Sheretz RJ and Jarvis WR. Vascular Catheters Inserted in the Trenches Versus Guideline Documents: Can the Discrepancies be Resolved? Infection Control and Hospital Epidemiology 2003;24:887-889.

9. Jarvis WR. Controlling Antimicrobial-resistant Pathogens. Infection Control and Hospital Epidemiology 2004;25:369-372.

10. Jarvis WR. Prevention and control of methicillin-resistant *Staphylococcus aureus*: dealing with reality, resistance, and resistance to reality. Clin Infect Dis. 2010;50:218-20.

11. Jarvis WR. Prevention and control of methicillin-resistant *Staphylococcus aureus:* dealing with reality, resistance, and resistance to reality. Clin Infect Dis. 2010;50:218-20.

Surveillance Reports

1. Centers for Disease Control. National Nosocomial Infections Study Report, Annual Summary 1979, March 1982.

2. Jarvis WR. *Haemophilus influenzae* Prophylaxis Update: Household and Child Care Center Contacts. Georgia Epidemiology Report 1982:12;23.

3. Jarvis WR. Changing Practices in the Use of Benzyl AlcoholPreserved Solutions, Neonatal Intensive Care Units, Georgia. Georgia Epidemiology Report 1983:5;4.

4. Hughes JM, Culver DH, White JW, Jarvis WR, Morgan WM, Munn VP, Mosser JL, and Emori TG. Centers for Disease Control. Nosocomial Infection Surveillance, 19801982. In: CDC Surveillance Summaries. MMWR 1984:32;1SS17SS.

5. Jarvis WR, White JW, Munn VP, Mosser JL, Emori TG, Culver DH, Thornsberry C, and Hughes JM. Centers for Disease Control. Nosocomial Infection Surveillance, 1983. In: CDC Surveillance Summaries. MMWR 1984;33:9SS23SS.

6. Horan TC, White JW, Jarvis WR, Emori TG, Culver DH, Munn VP, Thornsberry C, Olson DR, and Hughes JM. Centers for Disease Control. Nosocomial Infection Surveillance, 1984. In: CDC Surveillance Summaries. MMWR (No 1SS): 1985: 17SS29SS.

7. Jarvis WR and Tipple MA. *Y. enterocolitica* Bacteremia and Endotoxin Shock Associated with Red Blood Cell TransfusionU.S. MMWR 1988;37:577578.

8. Panlilio LA, BeckSague CM, Tablan OC, and Jarvis WR. Contaminated PovidoneIodine SolutionTexas. MMWR 1989;38:133134.

9. Jarvis WR, Pegues DA, BeckSague CM, Arduino M, Bland LA, and Favero MS. Acute Allergic Reactions Associated with Reprocessed HemodialyzersVirginia, 1989. MMWR 1989;38:873874.

10. Shekar S, BeckSague CM, and Jarvis WR. Increase in National Hospital Discharge Survey Rates for SepticemiaU.S., 19791987. MMWR 1990;39:3134.

11. Polder JA, Bell DM, Baker E, Castro K, Chamberland M, Curran J, Folks T, Garner J, Hughes J, Jaffee H, Jarvis W, Marcus R, Martone W, Mullan R, Schochetman G, Henderson D, Katz D, Litterest C, McGowan J, Reck L, Whitescarver J, Arrowsmith J, Beninger P, and Matheny S. Management of Occupational Exposure to Human Immunodeficiency Virus (HIV), Including Considerations Regarding Zidovudine Postexposure Use. MMWR 1990;39:RR114.

12. Jarvis WR, Villarino ME, McNeil MM, Lee S, Hall W, Gensheimer K, Francis B, Waterman S, Rutherford, Bland LA, Arduino M, and Rutherford G. Postsurgical Infections Associated with an Extrinsically Contaminated Intravenous Anesthetic Agent. MMWR 1990;39:426433.

13. Swartz B, Auerbach S, Good R, Jarvis WR, Hansen JL, Paulissen JP, Larson AL, Solon

B, Langkop C, Francis BJ, Gladbch P, Lipe C, Wood C, Fiorelli M, Williams D, Atamura A, Merriweather RA, Gray B, Averill M, Smith JW, Haley CE, Simpson DM, and Breiman R. Nursing Home outbreaks of Invasive Group A Steptococcal Infections - Illinois, Kansas, North Carolina, and Texas. MMWR 1990;39:577-579.

14. Tablan OC, Koo D, Reingold AL, Werner SB, Rutherford GW, Lippman OD, Lowe TJ, and Jarvis WR. Epidemic Keratoconjunitivitis in an Ophthalmology Clinic-California. MMWR 1990;39:598-600.

15. Dooley S, Beck-Sague CM, Hutton M, Uuuamchandani R, Reyes R, Dittes S, Cleary T, Pitchenik A, Fischl M, Otten J, Breeden A, Hilsenbech C, Burr J, Simmons J, Bigler W, Valdez H, Cacciatore R, Witte J, Calder RA, Snider D, and Jarvis WR. Nosocomial Transmission of Multidrug-Resistant TB to Health-Care Workers and HIV-Infected Patients in an Urban Hospital-Flordia. MMWR 1990;39:718-722.

16. Pegues DA, BeckSague CM and Jarvis WR. Acute Allergic Reactions Associated with Reprocessed Hemodialyzers, U.S.An Update. MMWR 1991;40:147-154.

17. Pearson MP, Jarvis WR, Levine W, Igram CT, Finton R, Smith JD, Moon RE, ArrowsmithLowe JT, Brunner E, Elsae WR, Wilber JA, MacCormack JN, and

Francis BJ. Elevated Intraoperative Carbon Hemaglobin Levels in Surgical Patients. MMWR 1991;40:247-249.

18. Jarvis WR. *Y. enterocolitica* Bacteremia and Endotoxin Shock Associated with Red Blood Cell TransfusionU.S., Update 1991. MMWR 1991;40:176-178.

19. Pearson M, Kelly D, Setlock M, Davis JP, Beck-Sague CM, and Jarvis WR. Anaphylactic Reactions During General Anesthesia Among Pediatric Patients--United States, January 1990 - January 1991. MMWR 1991;40:437-443.

20. Pegues DA, Welbel S, Jarvis WR, Bond W, Alvarado CJ, Stolz SM, Maki DG, Fraser V, Jones M, O'Rourke S, Wallace RJ, and Lowe JT. Nosocomial Infection and Pseudoinfection from Contaminated Endoscopes and Bronchoscopes--Wisconsin and Missouri. MMWR 1991;40:675-678.

21. Zaza S, Yomtovian R, Hierschler J, Bland LA, Arduino M, and Jarvis WR. Bacterial Contamination of Platelet Pools--Ohio, MMWR 1991.

22. Zaza S, Coronado V, and Jarvis WR. Postsurgical Infections Associated with Nonsterile Implantable Devices. MMWR 1992;41:258.

23. Beck-Sague CM, Arrowsmith-Lowe J, Padyhe A, and Jarvis WR. Recall of Laparotomy Sponges - United States, 1993, MMWR 1993;42:755.

24. Fridkin SK, Velandia MP, Cardenas VM, Boshell J, Ramirez G, Bland LA, Iglesias A and Jarvis WR. HIV Transmission in a Dialysis Center-Columbia, 1991-1993. MMWR 1995;44:404-412.

25. Danzig L, Hendricks K, Schulster L, Bell RL, Cousins J, McNeeley W, Payne A, des Viger Kendrick M, Simpson D, Tormay M, Itano A, Mascola L, Vugia D, Rosenberg J, Waterman S, Safranick TJ, Jarvis WR and Alter M. Outbreaks of Hepatitis B Virus Infection Among Hemodialysis Patients-California, Nebraska, and Texas 1994. MMWR 1996;45:285-289.

26. Dembrak ZF, Kellerman S, Cartter ML, Hadler JL and Jarvis WR. Assessment of Testing for and Completeness of Reporting of Vancomycin-resistant Enterococci-Connecticut, 1994. MMWR 1996;45:289-291.

28. Chang T, Christianson JC, Pavia AT, Bobrin BD, Bland LA, Carson LA, Arduino MJ, Verma P, Aguero SM, Carroll K, Jenkins E, Daly JA, Woods ML, and Jarvis WR.

Ochrobactrum anthropi Meningitis Associated Cadaveric Pericardial Tissue Processed with a Contaminated Solution, Utah, 1994. MMWR 1996;45:671-672.

29. Kuehnert M, Clark E, Chia J, Waterman S, Soll D, and Jarvis WR. *Candida albicans* Endocarditis Associated with a Contaminated Aortic Valve Allograft-California, 1996. MMWR 1997;46:261-263.

30. Mangram A, Silverman B, Franklin GM, Bolin R, Hensrud DD, Zeller WP, and Jarvis WR. Lactic Acidosis Traced to Thiamine Deficiency Related to Nationwide Shortage of Multivitamins for Total Parenteral Nutrition--United States, 1997. MMWR 1997;46:523-527.

31. Kuehnert M, Halpin TJ, Moore W, Waterman SH, Hadler JL, Wilcox KR, Ensign B, Simpson DM, Toomey KE, Rentas FJ, Dwyer DM, Haley R, and Jarvis WR. Red Blood Cell Transfusions Contaminated with *Yersinia enterocolitica*BUnited States, 1997. MMWR 1997;46:523-527.

32. Hiramatsu K, McDonald C, Tenover F, and Jarvis WR. Reduced Susceptibility of *Staphylococcus aureus* to VancomycinBJapan, 1996. MMWR 1997;46:624-625.

33. Jarvis WR and HICPAC. Interim Guidelines for Prevention and Control of Staphylococcal Infection Associated with Reduced Susceptibility to Vancomycin. MMWR 1997;46:626-628.

34. Smith T, Pearson ML, Martin R, Wilcox KR, Lancaster M, Hill B, Tenover F, and Jarvis WR. *Staphylococcus aureus* with Reduced Susceptibility to VancomycinBUnited States,
1997. MMWR 1997;46:765-766.

35. Smith T, Pearson ML, Martin R, Wilcox KR, Campbell C, Ellis H, and Jarvis WR. Update: *Staphylococcus aureus* with Reduced Susceptibility to VancomycinBUnited States. MMWR 1997;46:813-815.

36. Rhame F, Maki D, Bennett JV and Jarvis WR. Nosocomial Bacteremias Associated with Intravenous Fluid Therapy-U.S.A. MMWR 1997;46:1227-1233.

37. Alonso-Echanove J, Cairns L, Richards M, Kuehnert M, Pearson ML, Pearson M, Glodoft M, Stehr-Green P, Hedberg K, Fleming DW, Hall W, Johnson DR, and Jarvis WR. Adverse Ocular Reactions Following TransfusionsBUnited States, 1997-1998. MMWR 1997;47:49-50.

38. Wang S, Frenett C, Delorme M, LeMoyne C, Hockin J, Grillo FG, Killar T, Boyer SJ, Dwayer DM, Block C, Backewroth R, Shapiro M, Leu B, and Jarvis WR. Outbreaks of Gram-negative Bacterial Bloodstream Infections Traced to Probable Contamination of Hemodialysis MachinesBCanada, 1995; United States, 1997; and Israel, 1997. MMWR 1997;47:55-59.

39. Trick W, Labarca J, Peterson C, Bendana N, Mascola L, Kilmer L, Harvey S, Ross L, Meylan M, Teitelbaum P, Waterman S, and Jarvis WR. Nosocomial *Ralstonia pickettii* Colonization Associated with Intrinsically Contaminated Saline Solution-Los Angeles, California, 1998. MMWR 1998;47:285-287.

40. Duffy R, Brown S, Tokars J, Lubniewski A, Sides S, Fisher C, Tess A, Lewis T, Kuhn L, Lusk R, Donnell D, Dodson D, Edelhauser H, Anderson N, and Jarvis WR. Corneal Decompensation After Intra-ocular Ophthalmic Surgery, Missouri. MMWR 1998;47:306-309.

41. Duffy R, Tomashek K, Spry L, Stivers A, Morin R, Timmons T, Weaver S, Douglas C, Safranek T, Roche J, Groves C, Portesi D, Hawkins M, Dwyer D, and Jarvis WR. Multi-state Outbreak of Hemolysis in Hemodialysis PatientsBNebraska and Maryland, 1998. MMWR 1998;47:483-484.

42. Garrett DO, McDonald C, Wanderly A, Wanderly C, Arduino M, and Jarvis WR. Clinical Sepsis and Death in a Newborn Nursery Asssociated with Contaminated Medications BBrazil 1996. MMWR 1998;47:610-612.

43. Bell, M, Tokars J, Matrician L, Ange G, Burns S, Fanning L, Kioski C, Cage G, Harter G, Reese D, McFall D, Komatsu K, Englund R, and Jarvis WR. Nosocomial *Burkholderia cepacia* Infection and Colonization Associated with Intrinsically Contaminated Mouthwash-Arizona, 1998. MMWR 1998;47:926-928.

44. Richards C and Jarvis WR. *Enterobacter cloacae* Bloodstream Infections Associated

with Contaminated Pre-filled Saline Syringes-California, November 1998. MMWR 1998;47:959-960.

45. Toscano C, Archibald LA, Torres J, Murillo J, Bofill L, Rios A, Irausquin E, Isturiz R, Guzman M, Rubino L, Cordido M, and Jarvis WR. Rapidly Growing Mycobacterial Infection Following Liposuction and LiposculptureBCaracus, Venezuela, 1996-1998. MMWR 1998;47:1065-1067.

46. Alonso-Echanove J, Pierie LR, Finlayson J, Epstein JS, Gaines A, Varricchio F, and Jarvis WR. Hemolysis Associated with 25% Human Albumin Diluted in Sterile Water-United States, 1994-1998. MMWR 1999;48:157-158.

47. Smith TL, O=Day M, Boyle J, Moran TL, Winkelstein J, and Jarvis WR. Availability of Immune Globulin Intravenous for Treatment of Immune Deficient PatientsBUnited States, 1997-1998. MMWR 1999;48:159-163.

48. Parvez F, Gaines A, Varricchio F, Kapit R, Pierce LR, Scott D, Finlayson J and Jarvis WR. Renal Insufficiency and Failure Associated with IGIV Therapy. MMWR 1999;48:518-521.

49. Roth VR, Stricof RL, Oxtoby MJ, Smith PF, McGarry MA, Hay V, Rientsema W, Rogers N, Segal-Maurer S, Marks S, Rahal JJ, Prodhom G, and Jarvis WR. Bronchoscopy-Related Infections and PseudoinfectionsBNew York, 1996 and 1998. MMWR 1999;48:557-560.

50. Hunt C, Dionne M, Delorme M, Murdock D, Erdrich A, Wolsey D, Groom A, Cheek J, Jacobson J, Cunningham B, Shireley L, Cameron S, Schlievert P, Pfieffer J, Johnson S, Boxrud D, Bartkis J, Besser J, Smith K, LaDell K, O=Boyle C, Lynfield R, White K, Osterholm M, Moore K, and Jarvis WR. Four Pediatric Deaths from Community-Acquired Methicillin-Resistant *Staphylococcus aureus*BMinnesota and North Dakota, 1997-1999. MMWR 1999;48:707-710.

51. Alexander LA, Khurshid MA, Chou T, Carey R, Larsen R, Conover C, Bornstein SL, Tenover F, Jarvis WR, and Fridkin S. *Staphylococcus aureus* with Reduced Susceptibility to Vancomycin, Illinois, 1999. MMWR 2000;48:1165-1167.

52. Ostrowsky B, Baughman W, Farley M, Toomey K, Daily P, Rothrock G, Gelling L, Mokerjee N, Barrett N, Pass M, White K, Rainbow J, Damaske B, Stenfonek K, Barnes B, Zansky S, Morin C, Phan Q, Mosher P, Hadler J, Jarvis WR, and Tenover F. Laboratory Capacity to Detect Antimicrobial Resistance. MMWR 2000;48:1167-1171.

53. Grohskopf L, Archibald LK, Tansuphasawadikul S, Eampokalap B, Chaovanich A, Rhuanpumkankit S, Kaxembe P, Nwanyanwu O, Dobbie H, Reller LB, Methchok B,

and Jarvis WR. Disseminated Infection with *Mycobacterium simiae* and Simiae-Avium (SAV) Group Mycobacteria in Persons with the Acquired Immunodeficiency SyndromeBThailand and Malawi. MMWR 2002:51(23);501-502.

54. Moore K, Abbas AG, Lutale J, Archibald LK, Beckles G, and Jarvis WR. Tropical Diabetic Hand Syndrome in Dar es Salaam, Tanzania, 1998B2002. Morbidity and Mortality Weekly Report 2002;51:969-970.

Letters to the Editor

1. William R. Jarvis. *Pasteurella multocida* in Dog Bites. American Journal of Diseases of Children 1983;135:283.

2. William R. Jarvis. Cardiopulmonary Resuscitation in Hepatitis B Carriers. Journal of the American Medical Association 1983;250:12156.

3. William R. Jarvis. Frequency of Enteral Feeding Tube Changes. Hospital Infection Control 1983:10;159.

4. William R. Jarvis. Tobacco Smoke as Fomite. Journal of the American Medical Association 1986;256:2591.

5. William R. Jarvis. MethicillinResistant Staphylococcus Infection: Control of StaffTransmitted Infection. Journal of the American Medical Association 1988:259:2151.

6. William R. Jarvis. How Should ICPs Determine if Candida Infections are Nosocomial? Hospital Infection Control 1986;13:8187.

7. William R. Jarvis. Should Cystic Fibrosis Patients with Pseudomonas be Isolated? Hospital Infection Control 1987;14:7778.

8. Horan TC, Culver DH, Jarvis WR, Emori TG, Banerjee S, Martone W and Thornsberry C. Pathogens Causing Nosocomial Infections: Preliminary Data From the National Nosocomial Infections Surveillance System. The Antimicrobic Newsletter 1988;5:6567.

9. Lowry P and Jarvis W. Transmission of Infectious Agents by Inadequately Sterilized ENT Instruments. New England Journal of Medicine 1989;320:741742.

10. Richet HM, Craven PC, Brown JM, Lasker BA, Cox CD, McNeil MM, Tice AD, Jarvis WR, and Tablan OC. Sternal-wound infections after cardiac surgery. New England Journal of Medicine 1991;324:1741-1742.

11. Tokars JI, Jarvis WR, Edlin FR, Dooley SW, Grieco MH, Gilligan ME, Schneider N, Montonez M, and Williams J. Tuberculin Skin Testing of Hospital Employees during an Outbreak of Multidrug-Resistant Tuberculosis in Human Immunodeficiency Virus (HIV)-Infected Patients. Infection Control and Hospital Epidemiology 1992;13:509-510.

12. Jarvis WR. Preventing the Spread of Vancomycin Resistance. Lancet 1994;344:119.

13. Maloney S, Pearson M, and Jarvis WR. Nosocomial Transmission of *Mycobacterium tuberculosis*. Annals of Internal Medicine.

14. Bennett SN and Jarvis WR. Propofol and Postoperative Infections. New England Journal Medicine 1995;33:1507.

1. McDonald LC, and Jarvis WR. Community-acquired Bacteremia In Zimbabwe and the Global Cost of Contaminated Blood Cultures. Pediatric Infectious Diseases Journal 1997;16:538.

2. Kuehnert MJ, Jarvis WR, Schaffer DA, and Chaffin DJ. Platelet Transfusion Reaction Due to *Yersinia enterocolitica*. Journal of the American Medical Association 1997;278:550.

3. Kuehnert MJ and Jarvis WR. Changing Epidemiology of Nosocomial Infections in Human Immunodeficiency VirusBInfected Patients. Clinical Infectious Diseases 1997;25:321-323.

4. Chang HW, Von Ryen CF, and Jarvis WR. *Malassezia pachydermatis* Infections. New England Journal of Medicine 1998;338:270-271.

5. Manangan LP, Sehulster LM, Chiarello L, Simonds DN, and Jarvis WR. Risk of Infectious Disease Transmission from a Common Communion Cup. American Journal of Infection Control 1998;26:538-539.

20. McDonald LC, Jarvis WR. Linking Antimicrobial Use to Nosocomial Infections: The Role of the Combined Laboratory-Epidemiology Approach. Annals of Internal Medicine 1998;129:245-247.

21. Kuehnert MJ, and Jarvis WR. Bacteria and the Safety of the Blood Supply in the United States. Annals of Internal Medicine 1998;129:164-165.

22. Smith TL, Pearson ML, and Jarvis WR. Vancomycin Resistance in *Staphylococcus aureus*. New England Journal of Medicine. 1999;341:207.

23. Labarca JA, McDonald LC, Pinto ME, Palavecino E, Gonzalez P, Cona E, Fernandez A, Giglio MS, and Jarvis WR. Proficiency in Detecting Vancomycin Resistance in Enterococci Among Clinical Laboratories in Santiago, Chile. Emerging Infectious Diseases Journal 1999;5:839-840.

24. Trick W and Jarvis WR. Colonization of Skilled-Care Facility Residents with Antimicrobial-Resistant Pathogens. Journal of the American Geriatric Society 1999.

25. Ostrowsky B and Jarvis WR. Vancomycin-Resistant Enterococci in Health Care Facilities. New England Journal of Medicine 2001;345:767.

26. Grohskopf L and Jarvis WR. *Serratia liquefaciens* Infections at a Hemodialysis Center. New England Journal of Medicine 2001;345:921.

27. LeDell K, Muto CA, Jarvis WR, and Farr BM. SHEA Guideline for Preventing Nosocomial Transmission of Multidrug-resistant Strains of *Staphylococcus aureus* and Enterococcus. Infection Control and Hospital Epidemiology 2003;24:639-641.

28. Kainer MA and Jarvis WR. HIV-1 and HCV Infections Among Antibody-Negative Blood Donors. New England Journal of Medicine 2004;351:2232-2235.

29. Muto CA, Farr BM, and Jarvis WR. Has Methicillin-resistatn *Staphylococcus aureus* Stopped Spreading in Intensive Care Units? Clinical Infectious Diseases 2005;41:269-270.

30. Muto CA, Vos MC, Jarvis WR, Farr BM. Control of nosocomial methicillin-resistant *Staphylococcus aureus* infection. Clinical Infectious Diseases. 2006;43:387-8.

31. Muto CA, Jarvis WR, Farr BM. Another tale of two guidelines. Clinical Infectious Diseases. 2006;43:796-7.

32. Jarvis WR, Muto C. Universal screening for methicillin-resistant *Staphylococcus aureus* by hospitals. Journal of the American Medical Association. 2008;300:504.

33. Farr BM, Jarvis WR. Methicillin-resistant *Staphylococcus aureus*: misinterpretation and misrepresentation of active detection and isolation. Clinical Infectious Diseases. 2008;47:1238-9.

34. Farr BM, Jarvis WR. Why we disagree with the analysis of Wenzel et al. Infection Control and Hospital Epidemiology. 2009;30:497-9.

35. Farr BM, Jarvis WR. Searching many guidelines for how best to control methicillin-resistant *Staphylococcus aureus* healthcare-associated spread and infection. Infection Control and Hospital Epidemiology. 2009;30:808-9.

36. Farr BM, Jarvis WR. What works and what doesn't for the control of methicillin-resistant *Staphylococcus aureus* infection: dogma and data. Clinical Infectious Diseases. 2009;49:987-8.

37. Farr BM, Jarvis WR. Prevention of surgical-site infections. New England Journal of Medicine. 2010;362:1541.

38. Farr BM, Jarvis WR. Transmission of resistant bacteria in intensive care. New England Journal of Medicine. 2011;365:762.

39. Edmonds SL, Macinga DR, Jarvis WR. Reply to letter to the editor on "comparative efficacy of commercially available alcohol-based hand rubs and World Health Organization-recommended hand rubs". Am J Infect Control. 2013;41:474-5.

40. Jarvis WR. Targeted decolonization to prevent ICU infections. N Engl J Med. 2013;369:1469.

Attachment B
Cases Testified as Expert at Trial or Deposition by William R. Jarvis, M.D.
(March 2013-March 2017)

Winston & Strawn LLP, Chicago, Illinois (SE Missouri Hospital and St. Francis Medical Center, on behalf of themselves and all others similarly situated v. C.R. Bard, Inc.). Deposition given.

Mr. Stephen M. Masters, Joliet, Illinois (Ronald Fuqua vs. Central Du Page Hospital Association). Deposition given.

Mrs. A. Candace Marcus, McIntosh Sawran Peltz & Cartaya, P.A., Fort Lauderdale, Florida (Bowman v. CCF Naples, et al.). Deposition given.

Mrs. Andrea Kott, Chicago, Illinois (Radak v. Evanston Northwestern Healthcare Corporation, et al.). Deposition given.

Mr. Mark Levine, Bartlit Beck Herman Palenchar & Scott LLP, Chicago, Illinois (ICU Medical, Inc. v. RyMed Technologies, Inc.). Deposition given.

Mr. Steven J Klearman, Reno, Nevada (Nolan v. South Lyon Health Center, et al.). Deposition given.

Mr. Thomas Saieva, Esq., Saieva & Stine, P.A., Tampa, Florida (Adolphson v Memorial Hospital of Tampa). Deposition given.

Mr. J. Dan Smith, McDonnell Boehnen Hulbert & Berghoff LLP, Chicago, Illinois (Ivera Medical Corporation v. Hospira, Inc.). Deposition given.

Mr. Ed Ciarimboli, Fellerman Ciarimboli Law, PC, Kingston, Pennsylvania (Una Valanski vs Hampton House, Hampton House Wilkes-Barre PA, LLC, HCR Manorcare, Leonard Kuchemba, M.D., Intermountain Medical Group). Trial testimony given.

Mrs. Carly S. Levin, Esq., Venable LLP, Washington, DC (Ivera Medical Corporation and Becton Dickinson and Company vs. Hospira, Inc. and Catheter Connections, Inc.). Deposition given.

Janet, Jenner & Suggs, LLC, Columbia, South Carolina (Frank Heaps, III v. Lexington County Health Services). Deposition given.

Mr. Ciarimboli, Fellerman Ciarimboli Law, PC, Kingston, Pennsylvania (Una Valanski vs Hampton House, Hampton House Wilkes-Barre PA, LLC, HCR Manorcare, Leonard Kuchemba, M.D., Intermountain Medical Group). Trial testimony given.

Mr. H. William McIntosh, The McIntosh Law Firm, PC, Kansas City, MO (Thurmond, et al. v. Kloster, et al.). Deposition given.

Mr. Ed Ciarimboli, Fellerman Ciarimboli Law, PC, Kingston, Pennsylvania (Janice Yalch vs. Alex Huang, M.D., J.T. Juang, M.D., P.C., Jung T. Huang, M.D., Geisinger South Wilkes-Barre Health System, Geisinger Clinic). Trial testimony given.

Mr. William W. Bird, The Bird Law Firm, P.C., St. Joseph, Missouri (James K. Sullwold, et al. v. Heartland Regional Medical Center a/k/a Mosiac Life Care, Inc.). Deposition and trial testimony given.

Mr. Theodore Walton, Clay Daniel Walton & Adams PLC, Louisville, Kentucky (Angie G. Huletter, Waller Hulette, Audrey Hulette, Emily Hulette and Andrew Hulette vs. GZA Geoenvironmental, Inc., et al.). Deposition given.

Mr. Jason C. Molesso, Sanders Viener Grossman, Mineola, New York (Loraine Angueira v. NYU Hospitals Center d/b/a NYU Hospital for Joint Diseases. Trial testimony given.

Attachment C
HEALTHCARE EPIDEMIOLOGY
2016 FEE SCHEDULE

William R. Jarvis, M.D.
Jason and Jarvis Associates, LLC
135 Dune Lane
Hilton Head Island, SC 29928
(Tel: 843-686-3750)

42338 Parkwood Drive
Port Orford, OR 97465
(Tel: 541-332-3750)

E-mail: WRJMJ@AOL.COM

Reviewing medical records, surveillance data, or other infection control records or policies	----------	$700/hour
Preparing written reports	----------	$700/hour
Conference calls/telephone consultation (including verbal reports):	----------	$700/hour
Depositions (minimum fee: $4,000)	----------	$800/hour
Trial testimony (minimum fee: $4,500)	----------	$900/hour

*When travel is required, lodging, transportation (air, train, cab, subway, miles driven, etc.), food, other expenses, and a per diem of $250 per hour for the duration of travel also will be charged.